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MR. JOHN A. GILRUTH, M.R.C.V.S., F.R.S.E.

FEW men can claim to have done so much, and fewer still to have done more, for our colonial veterinary service than the gentleman whose photograph we publish this month.

A Scotchman, born in 1871, Mr. Gilruth entered upon his veterinary studies at the Glasgow College, where his name figured largely on the prize list, his distinguished career as a student being completed by the award of the Principal's Gold Medal and bursary of £20. His final year was taken at the Royal Veterinary College in London, the diploma being obtained in 1892.

Having a desire to embark upon a colonial life, Mr. Gilruth applied for and obtained a position as Veterinary Inspector to the New Zealand Government, sailing for that country within a few months after receiving his diploma. It was not long after his arrival in that country before he found that the then state of the so-called Veterinary Department was a mere travesty of the name, and to Mr. Gilruth's persistent energy, and to that alone at the commencement of the struggle (although in late years backed up loyally by the combined efforts of his own staff and the whole agricultural community), must be attributed the efficient and well-organized system which at present exists. His presence in the Colony was soon felt, and his ability and skill were speedily recognised by the fact that he was given the appointment of Chief Veterinary Officer, with power to organize a staff and equip a laboratory. Insisting that all the veterinary staff should possess the qualification of the Royal College of Veterinary Surgeons, Mr. Gilruth selected a number of graduates as the result of applications made in response to advertisements in the professional journals, and shortly afterwards was sent over to Europe for a tour of study in the Pasteur Institute and various well-known Continental laboratories, taking the opportunity whilst in England to personally interview and select a further number of veterinary surgeons who were anxious to commence life in the Colony. At the present time the staff consists

of some thirty men, of whom the majority are duly qualified. In all his work, Mr. Gilruth has been ably and loyally assisted by his second in command, Mr. C. J. Reakes, M.R.C.V.S., an old college friend, who was one of the first to be appointed when the Veterinary Department was organized.

The principal work of the officers of the Department consists in the investigation of outbreaks of disease amongst the stock of the Colony, and the inspection of meat. By a law passed through the New Zealand Legislature, it has been enacted that every town of more than 2,000 inhabitants must possess a public abattoir, presided over by a duly-qualified veterinary surgeon, this official being held responsible for the condition of the meat which is sold for food; and it is no exaggeration to say that it is largely owing to this system of veterinary inspection that New Zealand meat has attained its present popularity in the English market. In fact, although it is with reluctance that we have to admit it, the matter of meat inspection is carried out on much more modern lines in New Zealand than in England, and in the initiation and organization of this Mr. Gilruth can justly claim a large share.

The position he now holds is that of Chief Veterinarian of the Veterinary Division of the Department of Agriculture, and, in addition, Pathologist to the Public Health Department. In connection with the latter, Mr. Gilruth was sent, with Dr. Mason (who is now Chief Health Officer), as one of the members of the Royal Commission on Public Health, to Australia, to investigate the bacteriology of bubonic plague during the first outbreak there; and it will also be remembered that he was the first scientist to demonstrate the existence of that dreaded disease, cancer, in fish. Last year his scientific and professional reputation was further recognised by his election to the Fellowship of the Royal Society of Edinburgh.

Of his other work the reports of the Department give full evidence, and recently his restless energy found vent in the organization of a Veterinary Defence Corps, of which the Government appointed him the head, with the title of Lieutenant-Colonel.

Still a young man, a Scotchman too, and full of the enthusiasm of his race, the veterinary profession of England may rest well contented that they will hear more of him, and that the veterinary progress of this, our youngest Colony, could not be placed in better hands.

Editorials.

OUR POISONED MILK SUPPLY.

At a Conference on the question of "Tuberculosis and the Milk Supply," recently held in Manchester, and at which delegates were present officially representing the Public Health Committees of the cities of Liverpool, Manchester, Birmingham, Leeds, and Sheffield, the statement was made "that the milk in about 10 per cent. of the churns sent into these towns contains the living infection of tuberculosis." This statement was based on the examinations of samples of milk taken under the strictest possible precautions on numerous occasions, and examined by well-known bacteriological experts. That such a condition of affairs should be possible seems almost incredible, but it is now such a well-established fact that the authorities have absolutely no excuse whatever for their delay in passing stringent regulations which shall check the evil.

We have most strict laws against the sale of chemical poisons, and we ought to have similar effective laws against the sale of bacteriological poisons. In fact, the latter, especially where such a universal food as milk is concerned, ought to be supervised even more carefully than the former. Both are dangers to the community, but it shows a most peculiar state of affairs when we find that stringent laws exist against chemical poisons (which could only be purchased by persons of sufficient age to voluntarily ask for them), whilst a food which is the mainstay of the lives of hundreds of thousands of helpless infants or invalids may be bacteriologically poisoned and distributed wholesale without any hindrance. Upon first hearing of such an idea the average layman will be ready to assert that, in England at all events, such a state of affairs is impossible; that it should be impossible we all agree but that it certainly exists is a well-known fact to every member of both the medical and the veterinary professions.

On one of the pages of the Report of the Royal Commission on Tuberculosis there is stated as follows: "There can be no

doubt that in a certain number of cases the tuberculosis occurring in the human subject, especially in children, is the direct result of the introduction into the human body of the bacillus of bovine tuberculosis, and there can also be no doubt that in the majority at least of the cases the bacillus is introduced through cows' milk. Cows' milk containing bovine tubercle bacilli is clearly a cause of tuberculosis, and of fatal tuberculosis, in man."

This report was issued more than a year ago, and matters relating to the hygiene of the dairy cow and its produce are still in the same state as they were then.

The report of the Conference above alluded to, and the well-authenticated statement that milk from about 10 per cent. of the churns contained living tubercle bacilli, must surely help materially to hasten forward the necessary steps to provide legislation to protect the consumer, and it is the duty of every medical man and every veterinary surgeon to urge forward upon all possible occasions the necessity for the authorities to insist upon a pure milk supply from healthy cows. The administration of the law should be universal and at the instigation of a central authority, not in any way left to the option of local bodies, and in the framing of an Act to deal with this question the word "shall" ought always to be inserted instead of (as is often the case at present) the word "may."

The factor which must astonish all thinking minds, lay or professional, is that such a state of affairs has been allowed to exist up to the present time. The number of people who die from tuberculosis every year is greater than the number who die in some of our great wars, and yet we are allowing conditions to exist which are absolutely preventable; all this, too, in a contest with a foe whose habits are known to be predatory and merciless. With our present-day knowledge at disposal such lax methods cannot be too strongly censured, and it behoves us as individuals, as well as a body of professional men with expert knowledge, to do our utmost to influence public opinion on a subject of such vital importance.

IS A REGISTRATION FEE ADVISABLE?

THE above question is one which is at present in the mind of every member of the veterinary profession, and as it is a point over which there has been some little difference of opinion it is well worth a little thought on the part of those who will eventually (if the new Veterinary Surgeons Amendment Act includes the Clause) have to pay. No one can deny the fact that the possession of money is absolutely essential for the Council of the Royal College to enable this body to carry out the duties with which it is entrusted by the electorate of the profession; and it is also a well-known fact that for many years they have not been able to protect our professional interests as fully as they would have liked, solely because they dared not risk the small pecuniary means at their disposal to do so. It was to obtain the power which the amount of money subscribed by an annual registration fee would give that this course was suggested.

The student could not, in fairness, be called upon to contribute further, as increased fees, either at the examination tables or upon receiving the diploma, would mean a hardship not only to this individual personally but also to his parent or guardian; it was necessary, therefore, to appeal to those who had already graduated. That this was the only fair plan was obvious, as it was to be the better able to protect the position of the fully qualified man that the idea of an annual fee was first considered advisable. The response made by the profession to the circular which was issued demonstrated clearly that the majority were quite willing to voluntarily submit to the annual tax. There were a few dissentient voices, but this was to be expected, as no measure of this kind was ever adopted without opposition; but the manner in which the bulk of the profession expressed themselves in favour of the scheme must have been very gratifying to its sponsors. As to whether the annual amount shall be one guinea or only half that sum the point is not yet definitely settled, but it is to be hoped that the former will be agreed upon, as with the income thus obtained the Royal College of Veterinary Surgeons will be able to maintain its proper position in a manner much more befitting a learned and scientific profession than at the present time. The funds will not be wasted, and in the crusade against quackery alone the practitioner will reap

much more substantial benefit than he can possibly estimate. Legal processes are always expensive undertakings, and in protecting our interests in this respect alone the Council will be able to do far more than they have ever been able to do in the past. Other matters, far too numerous to mention, will also receive their share of attention. Our councillors should, in common fairness, receive at least their out-of-pocket expenses, and the members of the Board of Examiners should be adequately remunerated. Post-graduate bursaries and grants are needed to stimulate and aid further research, and delegates representing the leading body of the profession ought certainly to take their proper places at scientific congresses and gatherings both in Great Britain and abroad. The College buildings are not beyond reproach, and when we compare our library and museum with those of our colleagues in human medicine, or even with those of our veterinary colleagues abroad, we feel constrained to drop the subject. Given the means to do it, there is no reason why all these things should not be remedied, and on every ground it seems advisable that the registration fee should be imposed.

General Articles.

DISEASES AND CONDITIONS OF CATTLE THAT MAY AFFECT THE QUALITY OF THE MILK.[1]

BY JOHN R. MOHLER, A.M., V.M.D., CHIEF OF THE PATHOLOGICAL DIVISION, BUREAU OF ANIMAL INDUSTRY.

Importance of a Wholesome Milk Supply.

THE importance of obtaining a hygienic and wholesome milk supply is recognised by all intelligent people, and should require no argument. Public health demands the purity of all milk and milk products. Next to bread, milk is more extensively used as an article of diet than any other foodstuff. It forms a portion of the food of almost every person on practically every day of the year. Moreover, unlike many other articles of diet, milk is consumed in most cases in an uncooked state, making it a very dangerous food should it perchance contain any deleterious organisms. The reasons for securing a supply of pure and wholesome milk are so numerous and so important that the consumer should become acquainted with some of the more essential of them in order that he may render assistance in bringing about a satisfactory improvement.

[1] Abstract from the Report of the Bureau of Animal Industry.

Not only is milk a very suitable medium for almost every description of germ life which may gain access to it in its journey from the cow to the consumer, but it may also become contaminated while still in the udder through infectious or poisonous material present in the cow herself. Consideration in this report will be given only to the latter aspect of the question of a wholesome milk supply. In this connection it will be necessary to keep in mind the requirements of an awakened public for a clean and wholesome milk, as well as the effect of any unreasonable or irrational demand upon the producer which may cause him heavy losses or even to discontinue his business.

It will also be apparent that, in order to produce milk in compliance with the requirements hereafter to be described, certain precautions must be taken which will necessarily entail additional expense upon the producer of this higher grade of milk. The customer must, therefore, expect to pay his portion of any legitimate advance in the cost of production, and such increase in the price of milk due to its improved quality should be considered as money well expended.

Furthermore, we cannot have good milk of safe quality without a realisation on the part of the farmer, the transportation agent, the dairyman, and the housewife, of the danger in utilising old, warm, or dirty milk. Education is, therefore, an important factor in the improvement of the milk supply, which cannot be accomplished through laws and regulations alone. In view of these facts, it is recommended that the subject be taught in the schools, that popular articles be frequently prepared for the Press, that lectures and demonstrations be given in towns and townships, that pamphlets in plain language be prepared by the health officer for general distribution, and especially that rules and suggestions, with reasons therefor, be placed in the homes of dairymen and dairy attendants.

Milk from Unhealthy Cows as a Factor in the Spread of Disease.—Tuberculosis.

Probably the most important disease of cows from the standpoint of public health is tuberculosis, and it is also the most prevalent. When Koch first discovered the cause of the disease and combined the announcement of his discovery with the statement that he considered the affection identical in both man and bovine, it was accepted by scientists as well as by the general public. His subsequent announcement in 1901, to the effect that this disease was different in man and in cattle, and that there was no practical need for preventing the use of the products of tuberculous animals for human food, was the cause of much rejoicing among those who were only too glad to grasp at any idea which would tend to separate the disease in man and in cattle, forgetting that bovine tuberculosis is also a dangerous disease to other cattle in the herd, and should be stamped out for this reason, aside from the danger to which man is exposed.

As a result of this radical statement of Koch's, which was based upon incomplete and unsatisfactory evidence, several Government commissions were appointed in different countries, and many private and public scientists immediately took it upon themselves to solve the question raised by that investigator. The results of these experiments were so strikingly similar that it is now the generally accepted opinion among scientists that people, especially children, may become

infected with tuberculosis from cattle. It is not known to what extent such infection occurs, nor is it possible to obtain any definite percentage by the method, formerly adopted, of looking for the primary lesions in the intestinal canal, although much statistical evidence is recorded showing that even by these figures primary intestinal tuberculosis of children has been observed in as high as 45·5 per cent. of the tuberculous cases examined. (Heller.) Evidence which must be considered conclusive has been obtained by the Bureau of Animal Industry, as well as by Ravenel and a number of French investigators, showing that tuberculous infection may take place through the intestinal tract without leaving any lesion in the abdominal cavity, the first alteration being found in the lungs or the thoracic glands. Therefore the presence of pulmonary tuberculosis in infants without intestinal lesions is no indication that the disease was not transmitted by the food, and the statistics above referred to are thus shown to be below the true percentage of cases of tuberculosis of intestinal origin.

These figures, however, do not give any satisfactory idea as to whether the bacilli entering the intestines originated from human or bovine sources. Owing to this fact, it follows that the only way of determining the infection of people by bacilli of the bovine type will be to study the lesions in the body of as many cases of human tuberculosis as is possible. Already we have sufficient data to give us some idea of the extent of tuberculosis of the bovine type in children, without considering the numerous cases of direct transmission recorded by many physicians, especially of instances of butchers and others receiving accidental infections of the skin with the bovine organism. Moreover, according to von Behring, the question of infection in man usually goes back to childhood, as he believes that many of the cases of pulmonary tuberculosis in adults are of intestinal origin, infection having occurred primarily through the intestinal tract by drinking tuberculous milk during infancy, and having remained latent until adult life.

The finding of the bovine type of tubercle bacillus in human lesions is the most direct and positive proof that tuberculosis of cattle is responsible for a certain amount of tuberculosis in the human family. Numerous experiments with this object in view have already proved this fact. Thus the German Commission on Tuberculosis examined sixteen different cultures obtained from tubercular lesions in children, and found four which were more virulent than is usual for human tubercle bacilli, causing tuberculosis in the cattle inoculated with them, and making 25 per cent. of the cases tested that were affected with a form of tuberculosis which, by Koch's own method, must be classified as of bovine origin. In a similar series of tests conducted by the British Royal Commission on Tuberculosis sixty cases of the disease in the human subjects were tested, with the result that fourteen cases were claimed by this Commission to have been infected from bovine sources. Ravenel reports that of five cases of tuberculosis in children two received their infection from cattle. Theobald Smith has also reported on one culture of the bovine tubercle bacillus obtained from the mesenteric glands of a child out of five cases examined, and, according to a recent paper by Goodale, Smith has recently been at work on seven other cultures from different children, four of which conformed to his idea of tubercle bacilli emanating from cattle. Of

four cases of generalised tuberculosis in children examined in the Biochemic Division of the Bureau of Animal Industry, two were found to be affected with very virulent organisms, which warranted the conclusion that such children had been infected from a bovine source. The Pathological Division of the same Bureau has likewise, out of the nine cases of infantile tuberculosis examined, obtained two cultures of tubercle bacilli that could not be differentiated from bovine cultures. In Europe so many similar instances of bovine tubercle bacilli having been recovered from human tissues are on record that it appears to your committee entirely proven that man is susceptible to tuberculosis caused by animal infections, and while the proportion of such cases cannot be decided with even approximate accuracy, it is nevertheless incumbent upon us to recommend such measures as will guard against these sources of danger when enforced.

The two principal sources of infection from cattle, and the only ones necessary to be considered, are the meat and milk of tuberculous animals. The fact that most of the cases of bovine tuberculosis above enumerated which occurred in the human subjects were cases of infantile tuberculosis, points with grave suspicion to the milk rather than the meat supply. This naturally leads to the question of how and under what condition does the milk become infectious. That milk coming from a tuberculous udder is capable of transmitting the infectious principle is conceded by all who have given the subject any consideration. It has been equally established that in advanced generalised tuberculosis the udder may secrete tubercle bacilli without showing any indication of being affected. Careful experiments performed by trained and eminently responsible investigators have also demonstrated beyond reasonable doubt that tubercle bacilli at certain times may be present in the milk of cows affected with tuberculosis to a degree that can be detected only by the tuberculin test, so that in a herd of cows in the various stages of tuberculosis it is to be expected that some of them will secrete tuberculous milk, which, when mixed with other cows' milk, makes the entire product dangerous. It has been shown by Eber in Germany and Schroeder in this country that, even when the tubercle bacilli are not being excreted by the udder, the dust and manure of the stable where the diseased animals are kept are in many cases contaminated with tubercle bacilli. This contaminated material may readily infect the milk during the process of milking, even though the milk comes from a healthy cow. The importance of this method of infecting milk cannot be too greatly emphasized, when it is known that cattle in prime condition, without any udder lesions and with but slight alterations in the lungs, frequently raise tuberculous mucus into the pharynx while coughing, then swallow this material, and thus contaminate the fæces. In a recent examination at the Bureau of Animal Industry Experiment Station of the manure passed by twelve cows just purchased from dairy farms in this city and affected with tuberculosis to an extent only demonstrable by the tuberculin test, tubercle bacilli were found in over 41 per cent. of the cases, both by microscopic examination and animal inoculations. The danger from this method of infecting milk is impressed upon us as consumers when we realize that on an average probably 25 per cent. of all the cows which supply milk to the district are tuberculous, and this is considered to be a conservative estimate, judging from the results of recent tuberculin tests.

Vital statistics show that fourteen out of every 100 people that die succumb to tuberculosis, while of the remaining eighty-six more than one half show lesions of tuberculosis on *post-mortem*, although dying from some other cause. The statement of von Behring, above-mentioned, is particularly pertinent in regard to the relation of human tuberculosis to the milk supply, especially in connection with the results of those investigators who have studied market milk and found from 5·2 to 55 per cent. of the samples examined to contain tubercle bacilli. Le Blanc considers the milk of tuberculous cows dangerous even when bacilli are not present, on account of the toxin it contains. Michellazzi has injected such milk into tuberculous animals and obtained a reaction.

To eliminate all tuberculous cattle from the herd, or to pasteurize all milk coming from untested cattle, should therefore be the object of all producers of milk, and the sanitarians will be remiss in their whole duty should they neglect to guard against the products of tuberculous animals in their attempts to eradicate tuberculosis from man.

Actinomycosis.

This disease, while not at all infrequent in the maxillary regions of cattle, is rarely located in the udder. It is readily mistaken for tuberculosis, owing to the diffuse lesions and the character of the pus. While no known case of actinomycosis in man has been traced to the milk, it is nevertheless advisable to condemn the milk from an infected udder, especially since the virus of the disease in man, in most cases, has been found to enter the body through the alimentary canal. Furthermore, there is usually in actinomycosis a mixed infection with pus-producing cocci, which emphasizes the necessity for prohibiting the use of the milk from such udders.

Botryomycosis.

Botryomycosis of the udder is only occasionally met with, but when it is observed the utilization of the milk therefrom should not be permitted. The disease is chronic and is accompanied by new connective-tissue formation and burrowing sinuses from which pus escapes. Mixed infection is liable to occur in this disease also, which adds to the danger in consuming the milk.

Foot-and-mouth Disease.

This affection is transmissible to man through the consumption of the milk from diseased animals, but, fortunately, the disease has been eradicated from this country, and it is to be hoped that this contagion will never require any serious consideration from the sanitarians of the United States in the future.

Anthrax.

In this disease the milk has an abnormal appearance and decomposes rapidly. The bacterium of anthrax has been recovered from milk fourteen days after it had been taken from an infected cow, which illustrates the importance of prohibiting the use of milk from such animals.

Cowpox.

This disease, which is probably becoming more common in this country, renders the milk unfit for food, and its distribution from cows so affected should not be permitted, inasmuch as the milk may become contaminated from the pustules and ulcers on the teats and in the sinuses of the udder, and produce infection by the alimentary canal of young children if it is consumed in a raw state.

The appearance of dark brown crusts on the teats and udders of cattle is suggestive of several conditions and should be carefully examined, particularly since the isolation by Dean and Todd of an organism identical with the Klebs-Loeffler bacillus from such lesions as well as from the milk. Diphtheria is not a disease of cattle, but it is possible for an abrasion to become infected with this organism from a human origin and the local lesion spread until it involves the milk sinuses. It was also suggested that this udder lesion might be due to an infected milker following the all too common habit of spitting on his hands before commencing to milk, and the bacillus passing up the milk duct might thereby infect the sinus.

Rabies.

The virus of rabies has in several instances been reported to have been passed to the offspring through the mother's milk. While it is not probable that cattle would be milked after the symptoms of rabies developed, it is nevertheless important to realize the danger of using such milk and the necessity for preventing calves from sucking such diseased cows.

Mammitis, Mastitis, or Garget.

This disease, or series of diseases, of the udder is by far the most frequent alteration noted. Usually only one quarter is affected, although the whole udder may at times be involved. The affected parts are greatly swollen and more or less painful in the early stages. The milk, at first normal in appearance, soon changes its character, becoming watery, light brown in colour, and in some cases contains flocculi and pus cells, and appears tenacious, slimy, or ropy. The cause of this condition is usually a streptococcus, although staphylococci are frequently incriminated in suppurative conditions of the udder, especially where abscess formation occurs. The milk from such an udder is objectionable from an æsthetic standpoint, and is also liable to give rise to gastro-intestinal disorders, especially in children. Such milk should be prohibited until the inflammatory condition entirely disappears.

Gastro-Enteritis.

The milk of cows affected with gastro-enteritis is of an abnormal character, being watery, of bitter taste, and changes quickly to a "sweet curdle." This milk is liable to produce digestive disturbances in the consumer, and should not be utilised.

Septic or Febrile Conditions.

The presence in the dairy of cows affected with such septic conditions as puerperal sepsis, septic metritis, diffuse phlegmon, suppurative wounds, and extensive ulcerations, constitutes a grave danger to the

milk supply, inasmuch as the milk may become infected with the pus-producing organisms, among which the streptococci are capable of causing enteritis in man. The milk of cows suffering from febrile conditions, especially when associated with sepsis, should also be excluded. In the case of small single wounds which cease to suppurate, the milk may be used without danger, providing the teats and udder are well cleaned before each milking.

Abnormal Appearance and Conditions of Milk.

The udder acts as a natural emunctory, like the kidney, and in consequence of its natural selective powers certain active principles contained in various foods, drugs, and poisons are eliminated thereby.

Slimy, Stringy, or Ropy Milk.

These conditions of the milk are not an uncommon occurrence, and sometimes are produced by a diseased condition of the udder of the cow, although in the majority of cases these abnormal appearances of milk are caused by various kinds of bacteria infecting the milk after it has left the udder. While this altered milk may be perfectly wholesome, it is nevertheless unpalatable, and most consumers in this country would rather do without than drink such material.

Bitter Milk.

This condition in the milk is only secondary in importance to the slimy milk, and causes much trouble to the dairyman. Bitter milk may originate from two different sources. The first source is dependent upon the cow, while the second is due to the growth of bacteria in the milk after it has been drawn from the animal. The difference between these two classes of bitter milk is that the first has a decidedly bitter taste when freshly drawn, while the second class is sweet when taken from the cow, but the bitterness occurs after standing for a short time and increases in intensity. Only the former will be dealt with at this time. Bitter milk, when produced in the cow, may result from improper feeding with such herbs as lupines, wormwood, &c., or with raw Swedish turnips, cabbages, &c. Bitter milk may also be observed during the late stage of lactation, and has followed the infection of teat ducts with bacteria which act on the proteids as an enzyme, converting them into peptones and other products to which the bitter taste is probably due.

Coloured Milk.

Red milk may be produced by the effects of bacteria, but is usually the result of a mixture of blood with the milk due to an abrasion of the udder or teats, or to some other traumatism of the udder. It may also be due to the cow eating material containing a large amount of silica, as sedges, rushes, &c., or to plants containing red pigment, as madder root. Other plants which are said to impart colour to milk are alkanet, field horsetail, meadow saffron, and knot grass. *Bacillus cyanogenus*, the cause of blue milk, at times gets into the udder through the milk ducts and leads to a bluish discolouration of the secretion.

Taste and Odour.

The flavour of milk is very readily affected by the character of the feed, as, for instance, by turnips, garlic, wild onions, mouldy hay and grain, damaged ensilage, and distillery grain. The latter is said to cause hyperacidity of the urine and consequent eczema. With proper precautions, however, these substances can be fed to dairy cattle without producing ill-effects in the milk. The deleterious substances excreted with the milk are usually volatile oils contained in the food. They are found in the milk as well as in the body, generally in the largest quantity during the digestion of the food containing them, being eliminated rapidly through the various excretory channels. Thus, if these substances are fed eight or ten hours before milking, or if cattle in the spring are removed from the pastures containing garlic this length of time before milking, there will be little or no danger of contaminating the milk. Overkept, fermented, and soured foods tend to produce acidity and other changes in the milk. Swill, spoiled gluten meal, and ensilage put up too green, are all more or less injurious to milk. Distillery swill, in addition to the bad flavour which it gives the milk, may cause the secretion of small quantities of alcohol in the fluid. That such alcoholic milk is deleterious to children, as well as to the calves and lambs fed on it, is a well-known and accepted fact. Milk is also modified very sensibly by the use of certain medicines, and the list of drugs which are excreted in the milk and give it an abnormal odour or flavour or render it deleterious to the consumer, is quite lengthy. Among the more important may be mentioned opium, all volatile oils, purgative salts, rhubarb, arsenic, mercury, lead, zinc, iron, creoline, scammony, iodine, potassium iodide, antimony, bismuth, ammonia, and certain acids.

Poisonous Milk.

Toxic properties may be manifested in the milk of cows that have eaten certain poisonous plants. Thus poison ivy (*Rhus toxicodendron*) produces trembles in cattle, during which condition the milk is capable of producing in the consumer severe gastro-intestinal symptoms with weakness. Leaves of the common artichoke are also said to produce certain toxic properties in the milk, which result in abdominal pains and diarrhœa in the person consuming it.

Colostrum.

Milk should not be used within fifteen days of parturition or during the first five days after parturition. All cows should be dried off at least fifteen days before calving, not only for the sake of the animal, but also on account of the poor quality of such milk at that time. This milk before and after parturition is called colostrum, and is a yellow, viscid fluid of a strong odour, bitter taste, and acid reaction. The ingestion of such milk is liable to produce diarrhœa, colic, and other digestive disturbances.

Recommendations.

In view of the facts above enumerated the following recommendations are made :—

(1) That all cows on dairy farms producing milk for the District

of Columbia be tagged, tattooed, or otherwise marked for purposes of identification.

(2) That all milk produced on such dairy farms shall come from either tuberculin-tested cattle, which shall be retested at least once a year, or be subjected to pasteurization under the supervision of the Health Department in case the herd is not tuberculin tested.

(3) That no additions to any herd, whether the herd has been tested or not, shall be made in the future without subjecting the additional cattle to the tuberculin test.

(4) That no licence shall in future be granted except to applicants having herds free of tuberculosis.

(5) That the milk of cattle showing any of the udder affections above mentioned, or anthrax, rabies, gastro-enteritis, septic conditions, or clinical symptoms of tuberculosis, shall not be utilized as human food, even though the milk be pasteurized. Milk from cows fifteen days before and five days after parturition, and that from animals receiving any of the deleterious medicaments or foodstuffs previously mentioned, shall likewise be excluded.

(6) That the veterinary inspectors of the Health Department make frequent visits to dairies having untested herds, in order that they may discover all advanced cases of tuberculosis, or udder tuberculosis, as early as possible.

THE CAUSE, PREVENTION, AND TREATMENT OF MEDITERRANEAN FEVER.*

BY FLEET-SURGEON P. W. BASSETT-SMITH, ROYAL NAVY.

Historical Résumé of Recent Work.

The great prevalence of Mediterranean fever and the prolonged illness caused by it had constantly brought the disease under the consideration of those responsible for the well-being of the men in the Services, both at home and abroad. Not only were the hospitals at Malta and Gibraltar occupied by large numbers of men who had contracted the disease on the station, but the annual number of days' sickness and loss by invaliding to the Naval Service was enormous. Another very serious fact was the very large percentage of young and active officers attacked, who were often rendered incapable to perform their duty for many months.

A joint Commission of Navy, Army, and Colonial Service was recommended and accepted, to work under an Advisory Committee of the Royal Society. After three years of most painstaking and thorough investigation of the disease by laboratory and epidemiological methods, definite conclusions as to the source of infection and methods for prevention were arrived at, which have since been put into practice with most satisfactory results. Since June, 1906, practically no fresh cases have occurred in the Navy. The monetary saving to the country and the Navy alone must, therefore, be very large, and a great source of

* Paper read before the United Services Medical Society, on December 12, 1907, at the Royal Army Medical College, Millbank, S.W.

anxiety has been removed from all employed on the Mediterranean station.

During the sitting of the Commission, no less than forty-one distinct articles were contributed, and an enormous number of experiments were made.

The most important facts brought out step by step were: (1) The great vitality of the organism outside the body, when not exposed to direct sunlight. (2) The constant presence of the organism in the peripheral blood of cases suffering from the disease. (3) The escape of the organism from the body, chiefly through the urine. (4) The presence of the infective organism in the urine of apparently healthy men (ambulant cases). (5) Frequent infection of domestic animals, chiefly goats. (6) Infectivity of the urine and milk of these animals. (7) The high incidence of cases in patients and staff of hospitals. (8) The high incidence in officers, women, and children. (9) Occurrence of localised outbreaks (epidemic form). (10) Rare recovery of the organism from local mosquitoes, and very doubtful possibilities of their being distributors of the disease. (11) Complete cessation of cases where infected milk was removed from the dietary, or when it was properly sterilized.

The vitality of the specific organism outside the body was proved to be very great. When not exposed to direct sunlight, the soil of Malta became easily infected.

Next the infectiveness of the patients suffering from the disease was investigated, and it was found that the organism freely circulated in the peripheral blood throughout the whole course of the fever, though the minimum amount of blood necessary to give evidence of the *Micrococcus melitensis* was rather large (4 c.mm.) (Shaw). This presence in the peripheral blood of the infecting micro-organism gave considerable support to the theory that "blood-sucking insects" might convey the infection.

The paths by which the organism passed out of the body were next carefully investigated. All the secretions and excretions examined gave negative results until, by means of specially prepared nutrient media, Horrocks and Kennedy demonstrated that in the urine the specific organism was undoubtedly excreted. Many thousands of plates were made from patients suffering from the disease, giving a moderate percentage of recoveries (10 per cent.). Later the organism was found in the gall-bladder and abundantly in the mesenteric glands, proving that the chief paths of exit are the urine and the alimentary canal.

The next important step was made by Shaw, who demonstrated the presence of ambulant cases of the fever, whose blood reacted to the serum tests, and who were passing the infecting micro-organism in their urine.

Early in 1905, Zammit noted that the Maltese goats were to some extent susceptible to the disease, after feeding them with food containing living cultures of the *M. melitensis*. This investigation was followed up, and it was abundantly demonstrated that not only were the goats able to be artificially infected, but that about 50 per cent. of them acquired it naturally, and that they too were excreting the organism in their urine. From this it was but a step to thoroughly investigate the milk of such infected, though apparently healthy, goats, with the

result that in Malta 10 per cent. of the animals were found to yield milk rich in the specific micro-organism of the disease, and that this milk, when taken as food by monkeys and other animals, was able to produce typical attacks of Mediterranean fever. Further direct proof of the infectivity of the milk to man was fortunately forthcoming in a peculiar epidemic of the disease in the *personnel* of the ship "Joshua Nicholson." This ship stopped one day at Malta to pick up sixty-five Maltese goats for export to America; her crew consisted of twenty-three officers and men, most of whom drank freely of the milk. Eight of these contracted the fever; eight of the remainder left the ship at Antwerp and no further information about them was obtainable. Five of the goats died on the passage, and out of the remainder thirty-two were found to be infected on arrival in America.

During the last year of the Commission, much corroborative work was done by fresh investigators, and a thorough examination of the blood-sucking insects, &c., and their power to carry the disease was made. Horrocks and Kennedy had previously been able to demonstrate in four cases out of 450 the *M. melitensis* in the stomach of mosquitoes (*Culex pipiens* and *Stegomyia fasciata*), which had been caught in the fever wards of the hospital. The later work was, however, very unfavourable to the theory of mosquito infection. It was found that even if taken into the stomach the organisms lived only four days, and that they were voided alive in the excreta.

As regards methods of prevention; isolation of Mediterranean fever patients, the use of mosquito-nets, disinfection of effects, and sterilization of milk suppy, were carried out, without any marked reduction of cases. During the first week of April, 1906, as the milk was suspected of not being properly sterilized, samples were taken, and found to contain the *M. melitensis*. From that time sterilization for the hospital was efficiently done. Cases, however, continued to occur among the sick-berth staff, and it was found that these men had taken their milk separately before the sterilization process, and had used it. Since August 4, 1906, fresh milk for the hospital and whole fleet has been boiled, or preserved milk has been used, with the result that from June up to the end of December, 1906, only three cases occurred in the Naval Hospital. (Two were in men who lived on shore and acknowledged that they took unboiled milk.)

Very conclusive proofs of the "milk-infective theory" are also forthcoming from other sources, the most important being: (1) The practical disappearance of the disease from Gibraltar, following the removal of the infected goats. (2) The absence of the disease in the civil prison at Malta, with an average population of 185 persons, who are *not allowed milk*, the prison being situated in a populous district, where Mediterranean fever is common. (3) The great reduction of 90 per cent. in cases among the military since fresh milk has been more or less efficiently sterilized. (4) The continued prevalence of the disease among the civil population, who are not under any control, the total cases registered for 1906 being 724, against 632, the average of the last ten years. The fact that the fever is present in many other parts of the world besides Malta is brought forward by some as opposing this milk-infective theory, but it must be borne in mind that Maltese goats have long been famous as good milkers, and have been freely exported into other countries; also that in America, India, and South

Africa efficient workers have been able to demonstrate that the goats there, with their milk, contain the *M. melitensis*. Again, the fact is brought forward that a number of men do not acknowledge taking milk of any sort, but in the face of the overwhelming evidence in Staff-Surgeon Clayton's report one is forced to the conclusion that these statements are unreliable. It is, however, possible for infection to be contracted by preparations made from milk, both of goats and cows, and rarely by direct inoculation of the skin from infected clothing, &c.

Prevention by Vaccines.—At Malta some experiments were made on monkeys by members of the Commission to elucidate this point. Two monkeys were taken which had been given three separate injections of a specially prepared vaccine or dead culture of the *M. melitensis*, and two others which were quite healthy. All four monkeys were then given an injection of a living culture. The two former, or immunized, animals developed subsequently very slight fever, but in the latter, or non-immunized, typical attacks followed the injections; this showed a certain amount of protective action produced by the vaccine. From 1903-05, Dr. Eyre experimented with rabbits, goats, and horses, and he states the results were by no means so encouraging as was anticipated.

Notes on the Pathology.

When the *post-mortem* records of both man and animals are carefully gone through, the evidence of a general septicæmic infection of the body is very strong; for we find that, besides the fact of the organism being so frequently demonstrable in the peripheral blood, it occurs commonly in the deep-seated organs, &c. Bruce, Hughes, and others have obtained the micrococcus from the spleen in acute cases during life; but even as late as the eighteenth month, in a chronic cachectic case, which no longer gave an agglutinative reaction, I have obtained a pure culture from the spleen. In another case, which occurred at the London School of Tropical Medicine, a patient suffering from an undulant type of fever suddenly developed symptoms of infective endocarditis; a pure culture of the micrococcus was obtained from his blood, and at the *post mortem* recent endocardial ulcerations were present. Here we had a condition analogous to that produced by other septic organisms, as the pneumococcus and gonococcus. It must be evident, to all who have dealt clinically with many cases of the disease, that this explains those severe cardiac symptoms and acute rigors which are sometimes met with.

Besides the general infective symptoms, the organism, or its toxin, may at times produce marked local changes, giving rise to soft, fluctuating swellings over the sternum and ribs, &c., which are sometimes mistaken for abscesses. Among several of these cases, I well remember one who had a fluctuating tumour over the upper part of the sternum. From this I drew off some turbid fluid containing much cellular detritus, but no true pus, and from which the *M. melitensis* was isolated. Other swellings of a similar character were sterile, as if produced by the toxin alone, and resemble the localized indurations which occasionally take place at the site of the injection of a dead vaccine when used therapeutically. These should not be opened unless pus is certain.

Pathological Lesions.—From the large number of animals examined by the late Commission, the commonness of the infection of the

lymphatic glands was clearly demonstrated, and particularly the implication of the mesenteric glands, in those animals infected through feeding experiments. Shaw, in monkeys infected by feeding, found the organism in the mesenteric, axillary, and femoral glands, as well as in the liver, spleen, kidneys, and in the bile; in goats, in the spleen and mesenteric glands; in cats, in the mesenteric glands. Eyre came to the conclusion that in goats, in acute cases of short duration, the spleen and mesenteric glands were chiefly infected, but that in old cases the inguinal glands appeared to be the last resting-places of the *M. melitensis*, the infection of the kidneys and mammary glands being rather late phenomena. In man the micrococcus has been obtained in the heart blood, pericardial fluid, spleen, kidneys, liver, gall-bladder, pancreas, thyroid, salivary, supra-renal, mesenteric, inguinal glands, &c. Therefore, in the human subject the infection has by laboratory work been shown to be extensive.

In conclusion, I would most emphatically point out that the terms "Malta and Mediterranean Fever" are both wrong and misleading; that though lately the term "Septicæmia of Bruce" has been recommended, the old suggestion of Hughes that the disease should be called "Undulant Fever" is by far the most distinctive and satisfactory of any that have ever been employed; and I would recommend that the College of Physicians should be urged to incorporate this in the Nomenclature of Diseases.

(*Journal of the Royal Army Medical Corps.*)

UNIVERSITY OF LONDON.

FACULTY OF SCIENCE. GENERAL INTERMEDIATE EXAMINATION IN VETERINARY SCIENCE (PART I.) FOR INTERNAL STUDENTS.

PASS LIST, JANUARY, 1908.

502. Richardson, Ulick Forster, Royal Veterinary College.

Examiners:—Veterinary Anatomy: O. C. Bradley, E. S. Shave. Organic Chemistry: A. W. Crossley, Alexander Scott. Biology: J. Reynolds Green, J. Graham Kerr, W. H. Lang, E. A. Minchin.

Clinical Articles.

THE NERVOUS SYSTEM OF TWO DOGS WHICH PRESENTED VARIOUS NERVOUS SYMPTOMS.

BY F. E. BATTEN, M.D., AND GORDON HOLMES, M.D.

Case 1.—*White bull terrier, healthy till* 14 *months old, failure of eyesight, became dull, unsteady in gait, spasmodic movements of limbs, progressive deterioration. Killed when* 15 *months old. Microscopical examination: Marked perivascular infiltration, infiltration of brain tissue; the brain is more affected than the cerebellum or medulla, and the medulla more thau the spinal cord. The cell changes are most marked in the cells of the cortex. There is considerable degeneration of the cortico-spinal tracts.*

The case is that of a white bull terrier, born in July, 1906. He was healthy till September, 1907, when his owner noticed that the dog's eyesight was defective and he was becoming dull. Mr. Bower, F.R.C.V.S., who saw him on September 5, stated that the dog had chorea or some form of brain derangement. There was no acute onset, and the dog was not known to have had distemper. On September 10 he came under the care of Mr. Hobday, F.R.C.V.S., and although he improved to a certain extent in his general condition he slowly and steadily deteriorated.

On examination on October 10 the dog was in good condition, well-nourished, and had a good coat; he could take his food well. When left alone the dog walked round the stable in an aimless manner, the head bent down. He did not seem to see, and in walking round the stable was guided by the wall. When he came to a corner his progress was arrested, and he would apparently have remained standing in that position for an indefinite time unless his head was turned out, when he again went on his peregrination round the room. He walked on a very wide base in an ataxic manner, and had frequent sharp contractions of both the fore and hind limbs. He was easily upset by a tap on the buttock; he could, however, get up from the floor without help. There was no rigidity of the legs, and all movements were capable of being performed. All the reflexes were brisk. His sense of smell was deficient; he would eat up any food which was placed on the ground; if, however, it was in a bowl, he would push the bowl along the ground, and would only eat up the food if his nose were raised and put inside the bowl. The dog did not seem to hear, but Mr. Hobday states that white bull terriers are not infrequently congenitally deaf. The dog appeared to be quite blind. The pupils were large, but reacted to light. On examination of the fundus it appeared normal. After examination the dog was killed, and the *post-mortem* performed. The following is the report of the pathological condition found:—

No pathological change was visible to the naked eye in the central nervous system either at the time of the autopsy or when it was cut up after hardening in a 10 per cent. formalin solution. Marked changes were, however, found in sections taken from the different regions of the forebrain, brain-stem, and spinal cord. They were most marked in the forebrain, and were the same and varied only slightly in intensity in all the portions of it which were examined; they were, however,

PLATE I.

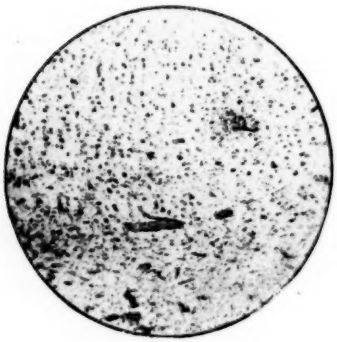


FIG. 1.

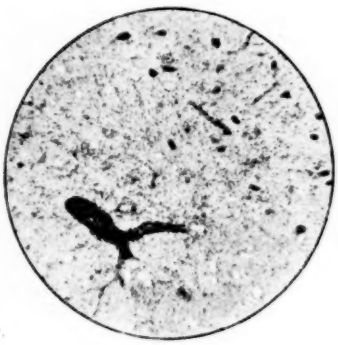


FIG. 2.

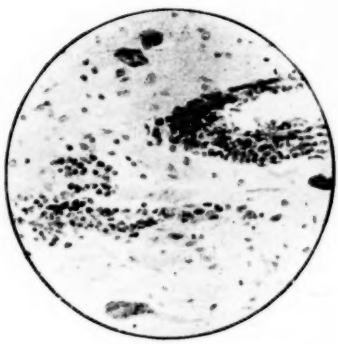


FIG. 3.

(For description see p. 187.)

somewhat greater in the grey than in the white matter. The most striking change was the presence of a large amount of perivascular cell infiltration. In many places these cells were limited to the adventitial sheaths and the perivascular spaces of the vessels, but in other places they broke into and infiltrated the surrounding brain tissue (plate i., fig. 3); and, finally, here and there the tissue is infiltrated by diffuse collections of cells not in the immediate neighbourhood of vessels (plate i., fig. 1). Apart from this cell infiltration there was very little evidence of disease of the vessel walls; at the most there is only a slight increase of the endothelial nuclei. A few infiltrating cells often surrounded the larger nerve-cells of the cortex, but they were then generally degenerating. The cell infiltration was not, as a rule, so compact in the nervous tissue as in the perivascular spaces. Similar collections of cells are seen in the soft membranes, but only in the immediate neighbourhood of the cortex; they are found chiefly around the vessels, but in places also in the loose tissue of the meninges.

The majority of these infiltrating cells are lymphocytes; each consists merely of a small round nucleus rich in chromatin, with little or no cytoplasm around it. A small number of plasma cells are also found, especially around smaller vessels where there is not yet a large collection of cells; their nuclei are similar to those of the lymphocytes, but they are surrounded by considerably more protoplasm. In addition to these infiltrating cells there is some proliferation of the cells of the adventitial sheaths of the vessels, and of the neuroglial nuclei in the foci, in which there has been much cell infiltration and destruction of tissue.

In the pons and medulla oblongata similar changes are found, but they are less intense. Here, too, the grey matter is more affected than the white, especially that in the neighbourhood of the fourth ventricle (plate i., fig. 2). There is very little disease in the cerebellum; in the white matter collections of small round cells surround many of the vessels, and in the cortex there are a few irregular foci in which the tissue is infiltrated by similar cells.

In the spinal cord there is practically no disease of the white matter, and in the grey matter there is only a very slight amount of perivascular cell infiltration, and here and there a small focus in which the tissue is infiltrated by similar cells.

No definite change could be found in the nerve-cells of the spinal cord, and even in the medulla and pons there was remarkably little change in the cells considering the intensity of the disease of the vascular and interstitial tissues. In the neighbourhood of foci of intense round-cell infiltration there was generally some disintegration of the tigroid. No definite changes could be recognized in the nerve-cells of the cerebellum. A considerable number of the cortical cells were destroyed in the patches of round-cell infiltration; in some of these the remains of cells can be seen surrounded by nuclei which seem to act as neurophages. As it is in the deeper layers of the cortex that the disease is generally situated, it is the cells of these layers which have suffered the most severely. Where the cortex is not infiltrated in this way there is but little visible alteration in the cells; in some there has been more or less, but usually only partial disintegration of the tigroid. In many places apparently normal cells

are seen lying along a vessel which is surrounded by a large amount of perivascular cell infiltration or on the border of a patch of disease. Here and there are cell changes suggestive of acuter disease, generally in the form of shrunken cells which stain very intensely and diffusely, and in which the nucleus is scarcely visible. A few swollen cells in definite chromatolysis are also found.

The Marchi method reveals an enormous amount of degeneration of the myelinated fibres of the forebrain (plate ii., fig. 4). Some of this degeneration is evidently of considerable age, as its fatty products, which are stained black by the osmic acid, are in places collected into large masses, and some of it has evidently already disappeared. It was chiefly the fibres of the white matter which were affected; relatively few degenerated fibres are found in the cortex, but this is probably due to the degeneration products having been already absorbed from here.

In the brain-stem there is marked degeneration of the pyramidal tracts (plate ii., figs. 5 and 6), and degenerated fibres are also found in some of the bundles which spring from its grey matter, as in the dorsal longitudinal bundles and in the vestibulo-spinal tracts.

In the spinal cord, too, it is chiefly the cortico-spinal tracts which are affected, but there is also a little diffuse degeneration in the rest of the ventro-lateral columns. This degeneration diminishes caudalwards; it probably represents affection of the fibres which descend to the cord from higher centres; probably none of the proprio-spinal fibres are degenerated. In the lower segments there is slight degeneration of some of the dorsal root fibres, and, owing to this, a little diffuse degeneration ascending through the dorsal columns (plate ii., figs. 7 and 8). There is no evidence of fibre degeneration in the grey matter or in the ventral spinal roots.

Case 2.—White bull dog, aged 2 years, history of previous attacks of similar nature, followed by recovery; present attack of gradual onset of some weeks' duration, became dull, unsteady in walking, and failed to take food. Microscopical examination: Marked perivascular and interstitial infiltration of brain. Cell changes most marked in the cells of cortex and medulla. Considerable degeneration of the cortico-spinal tracts.

The case is that of a large white bull dog (bitch) seen on December 1, 1907, with Mr. Hobday. There was a history of the dog having been in a similar condition on one or two previous occasions, and of having recovered.

For some weeks past the dog had been getting dull and stupid. She had become unsteady in walking and could not take her food.

When seen on December 1, 1907, she was very thin and wasted. She walked very unsteadily, the hind legs being drawn up and near the fore limbs, giving the animal a comparatively small base to walk on. The dog readily fell over into a sitting position on to its buttock. It could, however, rise with difficulty, and wandered round the stable in an aimless manner, being directed in its movements by the walls and the objects with which it came in contact.

Its sight was very deficient, if not absent. Hearing was very defective, but the nurse was of opinion that the dog could hear. The dog could not lap, and when its nose was placed in a bowl of food she made no attempt to eat it. She had to be fed with a spoon, the liquid being poured into the corner of the mouth, and it was even

then with difficulty swallowed. There were no spasmodic movements of the limbs, nor any localized paralysis. There was general unsteadiness and weakness. The knee-jerks were active. The dog could find her own kennel, and would lie in the straw for an indefinite period if undisturbed.

The dog was killed on December 2, and the *post-mortem* performed on the following day.

As in the previous case there were no pathological changes in the nervous system visible to the naked eye. The specimens were hardened in a 10 per cent. formalin solution, and after a few days several pieces were taken from the brain, brain-stem, cerebellum and spinal cord for microscopical examination. Sections from each of these regions were stained by Nissl's method to demonstrate the condition of the nerve cells; other sections by hæmatoxylin and van Gieson's picro-fuchsin mixture for the study of the general changes in the tissues, and some by Leishmann's and Unna-Pappenheim's stains, in order to study the nature of the cell infiltration which will be described; finally, other pieces of tissue were treated with Marchi's osmium-bichromate mixture to determine if any degeneration of medullated nerve fibres had taken place.

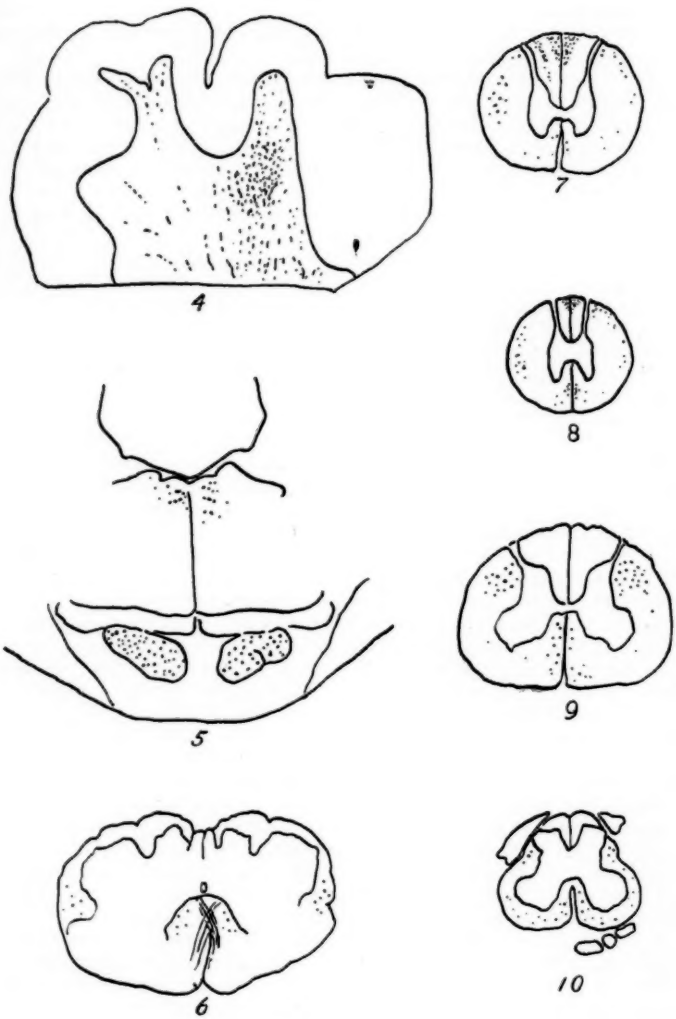
The changes we found were so similar to those in the nervous system of the other dog that a short description will suffice.

The affection of the forebrain was patchy, not uniform, but as in the first animal we examined its most striking feature was the infiltration of the perivascular spaces with small round cells of the lymphocyte type and with plasma cells. Very often this zone of infiltrating cells exceeded in breadth that of the calibre of the vessel. This was the only pathological change that could be seen in the greater portion of the cortex which was examined, but as in the white bull-terrier, there was in places some similar cell infiltration of the cortex itself; this was, however, always slight in degree. The affection of the white matter of the forebrain, which was also very patchy, was considerably more intense than that of the cortex. In one large focus of disease which lay under the right precrucial gyrus there was apparently almost complete destruction of the nervous tissue by cell infiltration and softening. The latter condition was associated with, and was probably due to, occlusion of the vessels by the pressure of the perivascular cell infiltration on them. A considerable proliferation of the neuroglia elements and large Deiters' cells, with a relatively large amount of protoplasm and branching processes, could be seen in, and especially around, the foci of severer disease. In addition, a slight proliferation of the elements of the adventitial sheaths of the vessels could be observed in places, otherwise the walls of the unoccluded vessels appeared unaffected. Here and there there was a considerable amount of coagulated serous exudate around the vessels.

The changes in the forebrain of this dog were consequently almost identical with those we have described in the other brain, but the chief incidence of the disease fell, not on the cortex but on the white matter of the hemispheres, and it was more irregular in distribution and degree. In places, small collections of lymphocytes were also found in the membranes of the brain, but this was scarcely general enough to warrant the title of meningitis.

Changes similar to those in the forebrain were also seen in the

PLATE II.



(For description see p. 187.)

midbrain, pons varolii, and medulla oblongata, but they were very much less in degree, and the grey matter was more affected than the white. The disease lay chiefly in the grey matter in or near the floor of the fourth ventricle, and also along some of the larger vessels. The cerebellum was practically free from disease, and no cell infiltration or evidence of vascular reaction was seen in the spinal cord.

As in the first case we describe the nerve cells were, considering the intensity of the interstitial disease, remarkably little affected, except where they were involved in, or destroyed by, the areas of small round-cell infiltration. The larger cells of the spinal cord, brain-stem and cerebellum were intact, but slight degenerative changes could be seen in some of those of the cortex of the forebrain.

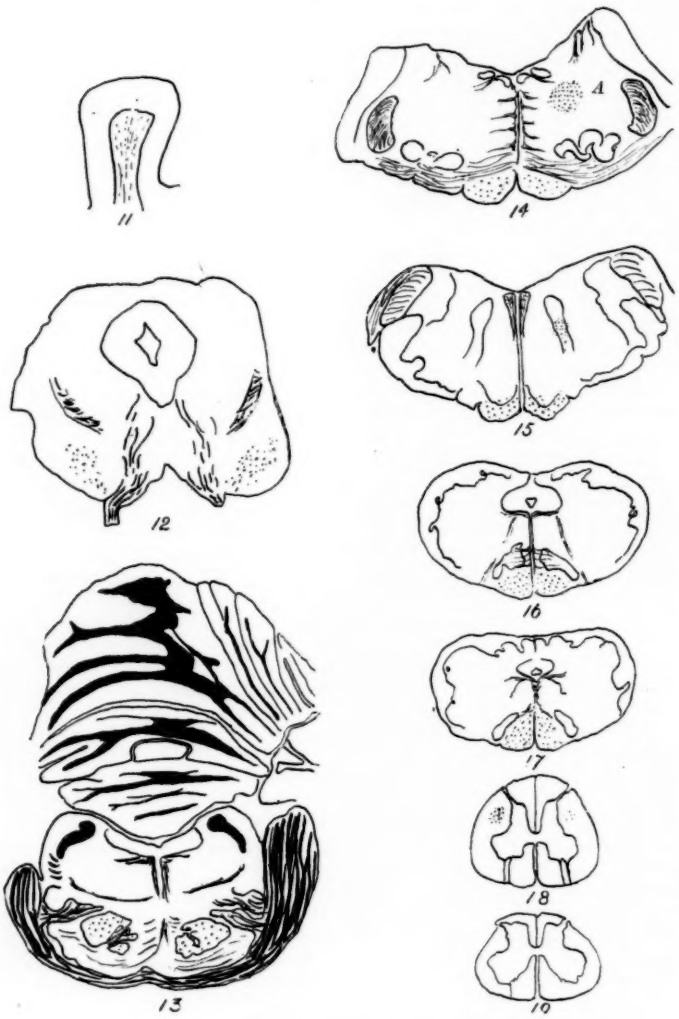
By the Marchi method we could see a considerable amount of degeneration of the myelinated fibres of the forebrain (plate iii., fig. 11). This was evidently due to destruction of some portions of the fibres by the inflammatory foci. Many fibres of the corpus callosum were degenerated, but the most prominent change was present in the internal capsules, which carry fibres from the cerebral cortex to the lower portions of the nervous system. In the midbrain the degeneration was practically limited to the middle of the crus (plate iii., fig. 12), which is the continuation of the internal capsule, and it was only in these fibres that there was any marked change in the pons varolii and medulla oblongata (plate iii., figs. 13, 14, 15, 16, 17). A few of the fibres of some of the longer tracts of the brain-stem, as of the inferior peduncle of the cerebellum, and of some of the tracts in the neighbourhood of the dorsal longtitudinal bundles, were also degenerated, and there was a focus of softening in the region of the seventh cranial nerve nucleus (plate iii., fig. 14A). The affection of these fibres was evidently secondary to the diffuse disease we have described in the grey matter of the brain-stem. There was no degeneration of the intrinsic fibres of the cerebellum. The most striking change in the spinal cord as revealed by the Marchi method, was a partial degeneration of the pyramidal tracts in the lateral columns (plate iii., figs. 18 and 19), but there was also slight degeneration in the ventral and in the dorsal columns; the latter was probably secondary to a partial degeneration of the dorsal root fibres.

It seems probable that in this case the incoordination and disorganisation of movement, which was the most striking clinical feature, was due to disease of the forebrain, but in the bull terrier the ataxia may have been largely due to the involvement of the higher co-ordinating centres of the brain-stem.

These changes indicate the existence of a chronic inflammatory process which has evidently affected the central nervous system through the blood-vessels, or through their adventitial or perivascular lymphatic spaces. We have been unable to discover the causal factor of this inflammation, but the changes in the nervous tissue itself are so slight that it may be with more probability attributed to the action of toxins circulating in the blood or lymph than to a direct infection of the brain itself.

These pathological changes bear a certain amount of resemblance to those which are found in the nervous system in general paralysis of the insane in man, in which one of the most striking features is the infiltration of the perivascular spaces by lymphocytes and plasma cells. Dr. Mott has described somewhat similar changes in the nervous

PLATE III.



(For description see p. 187.)

system in chronic trypanosome infection, as in sleeping sickness in man, and in dourine, or *maladie de coit*, of horses, and in both of these diseases he believes the changes are due to a chronic infection of the lymphatics of the nervous system.

Examinations of the nervous system of dogs which have had canine chorea in its more typical forms have been made by one of us (F.E.B.), and the same perivascular implication and degeneration of the myelin above described has been present also in these cases. It would seem, therefore, justifiable to assume that the disease from which these animals were suffering was chorea, although it cannot be held to be proved that such was the case. Numerous clinical types of chorea in the dog may be described. There are those cases in which involuntary rhythmical movements of the limbs are the most striking feature; other cases in which paraplegia, more or less complete, is the leading feature; other cases in which ataxia and circus movements are marked, and again other cases in which the mental symptoms are the most striking.

The present cases would seem to belong to the last class, but had some features of the second and third class.

Description of Plates.

Plate I.

Fig. 1.—A photomicrograph of a section of the cerebral cortex of the postcrucial gyrus. It shows small vessels surrounded by cell infiltration and a patch of cellular infiltration of the cortex. There is evidently only a very slight loss of nerve cells.

Fig. 2.—From a section in the neighbourhood of the hypoglossal nucleus in the floor of the fourth ventricle. There is a very large amount of perivascular cell infiltration around one of the vessels, and diffuse infiltration of the tissue by similar small round cells. The clear spaces mark where degenerated fibres have fallen out. Note that the nerve cells even within the patch of disease are fairly well preserved.

Fig. 3.—Photomicrograph from the same region as fig. 2 under a higher magnification.

Plate II.

Bull terrier, Case 1. Drawing from section of the cortex, medulla and spinal cord, stained by the Marchi method.

Fig. 4.—Section of the cortex. Shows a considerable amount of degeneration of the myelinated fibres. Some of this degeneration is of long standing.

Fig. 5.—Section of the pons showing degeneration in the pyramidal tracts, and also in the dorsal longitudinal bundles.

Fig. 6.—Section of the medulla showing degeneration in the pyramidal tracts.

Figs. 7 and 8.—Section of the spinal cord showing degeneration of the pyramidal tracts, and also of the posterior column, due to a focus of softening in the mid thoracic region.

Figs. 9 and 10.—Show degeneration of the pyramidal tracts.

Plate III.

Bulldog, Case 2. Drawings from sections of the cortex, crus, pons, medulla and cord, stained by the Marchi method.

Fig. 11.—Section of cortex showing degeneration of myelinated fibres.

Fig. 12.—Section of crus showing degeneration of pyramidal fibres.

Fig. 13.—Section of pons and cerebellum showing degeneration of pyramidal fibres, but no change in cerebellum.

Fig. 14.—Section of medulla showing degeneration of the pyramidal fibres, with an area of softening indicated by letter *A* in the region of the 7th cranial nerve nucleus.

Fig. 15.—Section of the medulla at lower level, showing same features as above with extension of area of softening.

Figs. 16, 17, 18 and 19.—All show degeneration of the pyramidal tracts.

ANOTHER CASE OF MESENTERIC ABSCESS DUE TO STREPTOCOCCIC INFECTION.

BY C. H. H. JOLLIFFE, VETERINARY CAPTAIN, 1st LIFE GUARDS.

HAVING read with much interest the notes on the above subject by Captain W. A. Pallin, A.V.C., in last month's issue of the VETERINARY JOURNAL, I am induced to submit the following account of another fatal case of an almost identical nature, but in a somewhat younger horse, that was recently under my care.

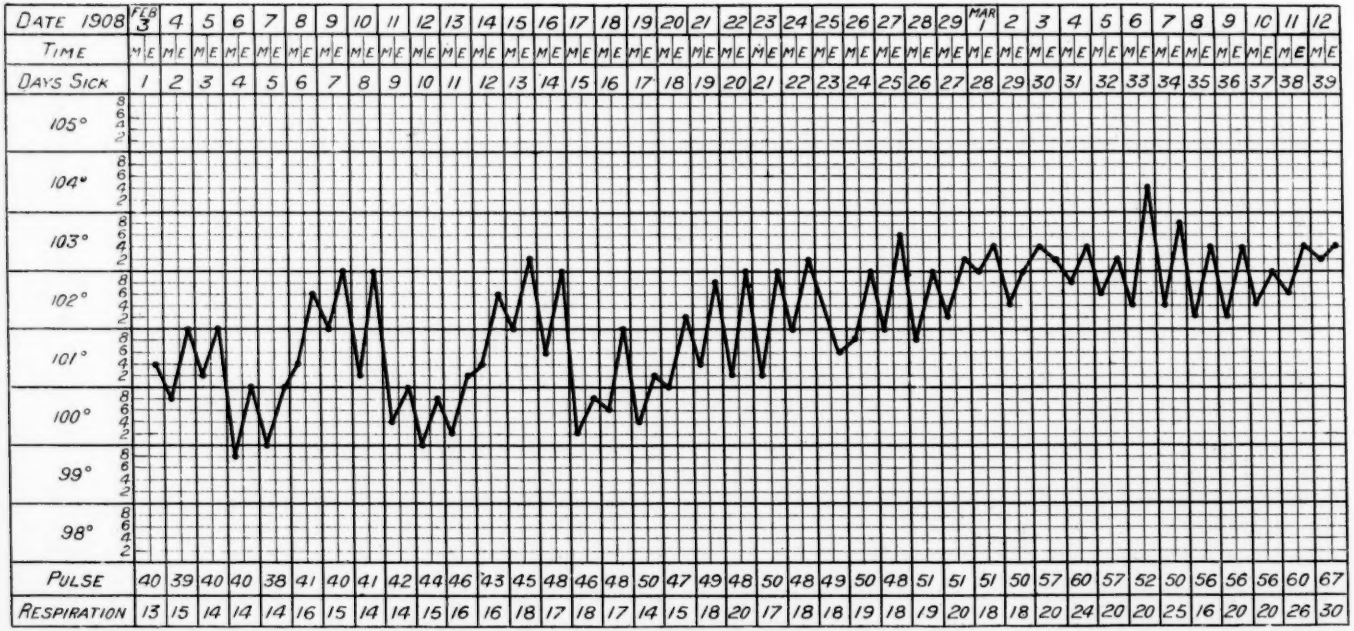
As a comparison of the two cases may be not uninteresting, I will describe the present one on the same lines as those adopted by Captain Pallin in the article referred to. *Subject*: Black gelding, aged 8 years, a troop horse of the 1st Life Guards. The "Veterinary History Sheet" shows the following previous entries from date of joining the regiment, viz., June 3, 1904:—

Disease.	Date of Admission.	Date of Discharge.	No. of days under treatment.	Result.
Abscess, Withers	5.6.04	20.8.04	76	Cured.
Rope Gall	14.8.05	9.9.05	26	Cured.
Influenza	24.6.07	3.7.07	9	Cured.

On February 3, 1908, the horse was reported to be dull, feeding badly, and to have been gradually losing flesh to a slight extent during the past month. He was now in moderate condition, but was hide-bound, his coat stared, and he looked generally out of sorts. Apart from this there was no history of previous illness, except for a slight attack of influenza last year. Clinical examination failed to reveal any cause for the horse's present state, and he was admitted to the sick-lines for observation on the above date.

As will be seen from the attached chart, the temperature rose to 102° F. on the two following evenings, and remained more or less above normal during the whole period of illness; it will be also observed that with only two exceptions the evening temperature was invariably higher than in the morning—a condition well recognised in connection with any pyogenic process.

A day or two after the horse had been reported sick, he was noticed to be showing very slight signs of dull, and more or less continuous, abdominal pain. He spent much time lying down; at times he would appear somewhat restless, and would occasionally walk round his box, and if watched almost at any time for a quarter of an hour or so, he would be seen to look round towards his flanks. Appetite varied considerably. Some days it would be fairly good, and at others there would be almost complete anorexia. Externally there was every appearance of general malaise, whilst, on the other hand, the visible mucous membranes were quite normal, and remained so. There was a slight degree of constipation. Examination of the urine and fæces gave a negative issue. The case was diagnosed as one of debility, aggravated in all probability by gastric dyspepsia and peristaltic atony, and although the elevation of temperature still remained unaccounted for, treatment was based on this assumption. Aloes was given; small doses of castor and linseed oil were tried, also sodium and magnesium sulphate, whilst stimulants and tonics, combined with ammonium carbonate, sodium bi-carbonate, and the usual bitter stomachics, &c., were additionally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administered. Enemata were also frequently used. No treatment, however, appeared to exert any influence on the condition, which showed little or no alteration from day to day, except for slight variations in degree of the signs already noted. Fairly free purgation was induced on one or two occasions. Rectal examination in an early stage of the illness was without result, but on further exploration of the abdominal and pelvic organs by this method on March 5, an enlargement, or "mass" of some kind, was distinctly perceptible in an inferior direction to, and inclined to the right of, the rectum. Unfortunately, it could only be indefinitely detected at the extreme distal ends of the fingers, with the arm inserted to its full extent (viz., to a distance of about 27 in.), which rendered it practically impossible to accurately determine the relations, nature, dimensions, or consistence of the abnormality. When first noticed, it seemed likely that it might consist of a portion of impacted ingesta, but the fact that it remained present and unaltered for several consecutive days effectually negatived this assumption. Pressure on the enlargement through the rectum appeared distinctly painful. A colleague, who was good enough to see the case with me, was of opinion, after a thorough examination of the patient, that the enlargement consisted of, and the illness resulted from, an intestinal calculus partially obstructing the lumen of the colon at a short distance anterior to the pelvic flexure. This certainly seemed a likely solution, though to the mind of the writer the presence of such persistent and well-marked pyrexia somewhat confuted the theory. The horse continued to show the same slight, dull, "colicky" pains, and was gradually losing strength and weight, and although it became more apparent each day that he was suffering from some very serious, and probably fatal, malady, it was not until 3 p.m. on March 12—some nine hours before his death—that there was any definite or appreciable change in his condition. It was then noticed that the horse had begun, quite suddenly and for the first time, to show well-marked evidence of acute illness, with severe, though by no means violent, abdominal pain. The abdominal walls seemed tense and painful. Cardiac stimulants, in the shape of alcohol, ammonia, strychnine, and digitalis, were administered, together with the usual anodyne agents, but the unfavourable signs increased with striking rapidity, and by 6 p.m. the horse was pulseless, collapsed, and clearly moribund. He soon appeared to lose consciousness of his surroundings, and death took place at 12.20 that night.

Autopsy.

A *post-mortem* examination was made at 11 o'clock the following morning, and showed acute general peritonitis to be the immediate cause of death. The peritoneum, both visceral and parietal, was intensely inflamed throughout, and showed, additionally, evidence of old-standing inflammatory lesions. The cavity contained a large quantity of purulent effusion with numerous lymphoid coagula, both adherent to the peritoneal surfaces, and floating free in the effusion. There were also extensive adhesions involving mostly the small intestine. The great and colic mesentery and mesenteric glands bore evidence of wide-spread suppuration. Of these structures a large proportion consisted of an amorphous mass, weighing approximately 30 lb., composed of inflammatory fibrous tissue and a series of large

abscess cavities with greatly thickened walls, and containing an immense quantity of pus and necrotic tissue. There was also a small inguinal abscess; but apart from this no secondary abscesses could be found, and it seems remarkable that the horse did not die earlier, either from septic intoxication or pyæmia.

The remaining organs were normal, with the exception of the heart, which showed a slight degree of endocarditis. On microscopic examination of the pus, numerous chains of streptococci were found, and Sir John MacFadyean, who most kindly examined some smears, expressed the opinion that there was very little doubt but that strangles was the origin of the streptococcic infection.

Remarks.

This case bears much resemblance in many respects to that reported by Captain Pallin. The duration of the illness was much the same in both cases, his being forty-seven days, and this one thirty-nine, and, generally speaking, the signs and symptoms were very similar. In neither case was there any evidence of communication between the abscess and alimentary canal. The principal differences seem to be centred around the following points:—

Capt. Pallin's Case.	The Present Case.
(1) Severe abdominal pain appears to have occurred in frequent paroxysms, and has been a prominent feature of the illness.	(1) Till immediately preceding death, any evidence of *severe* pain, either continuous or in paroxysms, was entirely absent.
(2) Mucous membranes discoloured.	(2) Mucous membranes normal throughout the illness.
(3) Rigors present.	(3) Rigors absent.
(4) Patient frequently found sitting up on haunches.	(4) Sitting position never resorted to.
(5) No evidence of abscess on rectal examination.	(5) Abscess clearly discernible on rectal examination, but not sufficiently distinct to admit of an unquestionable diagnosis until after death.

As to whether a mesenteric abscess is discernible or not *per rectum* would seemingly depend on the situation, dimensions, and extent of the suppurating area, and I gather that the detection of a "mass" by this means, as secured in the present case, is the exception rather than the rule, and I should attribute the circumstance to the facts that the abscess and surrounding inflammatory tissue covered a most unusually large area, that it extended to a considerable distance in a posterior direction, and that it involved both the great and the colic mesentery.

A striking feature of this case is the extreme suddenness of the onset of acute symptoms, and in view of the fact that extensive abdominal disease must have existed for a considerable time to have produced such lesions as were found *post mortem*, it seems remarkable that the horse should have lived so long, and, further, that he should have shown, comparatively speaking, so little clinical evidence of such pronounced pathological changes. With regard to treatment, it is quite obvious that no remedial measures could have been of any avail in a case of this description, at any rate in the later phases. There is consolation, however, in reflecting that, despite the high standard of perfection attained in modern abdominal surgery as applied to man-

kind, it is, nevertheless, extremely doubtful whether a human patient would have survived who suffered from a similar condition in an equally severe degree. Laparotomy would have been performed, the abscesses would have been evacuated, the whole diseased area removed, and the peritoneum washed out. But—would the patient have lived?

Regarding the use of anti-streptococcic serum, I have had no experience of its application, but if it really possesses value in checking a streptococcic invasion, it would seem that its exhibition in large and frequent doses the very instant that the disease is *suspected* even, and before it has time to assume any formidable proportions, would be a very justifiable, if not the only rational, procedure.

As to Captain Pallin's queries, "Did the secondary infection take place at the time the horse was under treatment for strangles, or was this mesenteric abscess due to subsequent infection?" since nearly seven and a half years elapsed between the primary attack of strangles and the horse's death from mesenteric abscess, the answer, in the humble opinion of the writer, would most probably be found in the latter hypothesis.

He further enquires, "How long would lesions such as those found on *post-mortem* examination take to develop?" If the rate of development of a superficial abscess can be taken as any guide to the same process as applied to a mesenteric abscess (as one would be inclined to think it might), then it would seem that two to three months would be a not unreasonable estimate.

TRAUMATIC ABSCESS OF PAROTID GLAND.

BY GEO. M. WALROD, STORM LAKE, IOWA.

On December 28, 1907, a lady presented a pug dog for treatment, with the history that he had not eaten anything for four days, and was all the time trying to swallow, and acted as if the effort caused him pain. This difficulty had appeared suddenly upon the return of the owner after a walk in the city upon which the patient had accompanied her. I could find nothing in the throat, but it seemed to cause pain when I pressed it on the outside.

After carefully examining the case, I diagnosed it as perhaps having a sharp bone in the throat. In the struggle he discharged from his mouth a little bloody mucus, after which he succeeded in eating a little food, which was better than he had done for four days.

My prognosis was favourable after I saw him eat a little. He was returned home, with directions to the owner to let him have plenty of fresh air, and return with him in a few days, which she did on January 7. At this time there was a swelling at the inferior part of the parotid gland. I cut into it, and recognised a sharp body which, on closer examination, I found to be a common sewing needle with about 6 in. of thread attached thereto, which the dog had attempted to swallow. I removed the offending agent and disinfected the wound, after which the dog made a prompt recovery.

A PUZZLING TUBERCULIN REACTION.

BY J. H. FRINK, ST. JOHN, NEW BRUNSWICK, CANADA.

SOME years ago, when the tuberculosis panic was at its height, and all milk was regarded as suspicious, if not pestilential, many cattle were tuberculin tested in the Province of New Brunswick.

Among the herds which I tested was one of a mixed lot of grade cows, consisting of thirty-five head, only one of which, a grade Durham cow, reacted. The result was not satisfactory to the owner, and indecisive to me, since it is very rare to meet with an isolated case in a large herd when the affected individual is kept closely stabled for a considerable period of time with the healthy animals. At the request of the owner, this cow was re-tested some three months later, and again reacted. She was then destroyed.

Upon *post-mortem* examination, after removal of the skin, there was found embedded in the subcutaneous connective tissue, and attached to the intercostal muscles just behind the shoulder, at the exact point of the tuberculin injection, a peculiar growth, apparently of quite recent origin, which might be compared in size and form to a large shrimp with tentacles and tail extended. An incision through this mass revealed the macroscopic appearances of tuberculosis. Some small mesenteric glands appeared slightly abnormal, but could not be pronounced tubercular upon macroscopic examination. No other disease could be detected. The shrimp-like enlargement was forwarded to the bacteriological department of McGill University for examination, and a positive diagnosis of tuberculosis was made by identifying the bacillus.

Did I infect the animal when I inserted the hypodermic needle? I think not, as I was careful to disinfect both the skin and the instrument prior to the operation.

Did the tubercular growth exist before I inoculated the animal? If so, it would seem a remarkable location for such a growth, and it was the only apparent one in the body.

When the growth was incised, it was found in a caseated state. Could an infection of three months' duration reach this caseated state?

Was the tuberculin impure and containing tubercle bacilli? The makers of tuberculin claim that such an occurrence is impossible, owing to the exactitude of the process.

Were the tubercle bacilli present in the body fluids and attracted to the point of inoculation by the insult to the tissues from the insertion of the hypodermic needle?

The animal was not advanced in pregnancy.

The first test was made on February 4, 1899, with the following temperature records: February 4, 100° to 101·2°; February 5, 6 a.m., 105°; 9 a.m., 104·4°; 12 noon, 100°; 3 p.m., 99·8°; 6 p.m., 99·8°.

It will be observed from this that the elevation of temperature was not long maintained.

The second test was made June 10. The maximum temperature after injection was 104°.

AZOTURIA IN AN EXTREMELY OLD HORSE.

BY C. W. J. HAWORTH, IROQUOIS, ONTARIO, CANADA.

THE patient, a bay gelding of French-Canadian stock, aged 27, in good condition, nervous temperament, somewhat headstrong, and used as a family driver. After having been in the stable for five days he was given a drive of 6 miles, and hitched under a shed. About one hour later he showed signs of uneasiness, with attempts at lying down, &c. He was unhitched from the wagon and placed in a stall, where he lay down and could not get up again, though they tried repeatedly to raise him up.

I found him down, perspiring profusely, rapid pulse, and the gluteal muscles tense. Azoturia was suspected, and catheterisation confirmed my suspicion, when the urine was found to conform in colour and odour to that disease. I administered a laxative with 2 oz. soda bicarb., 1 drachm cannabis indica, and ½ oz. ether nitrosi. He was warmly blanketed.

After half an hour he became very restless, and an effort was made to get him up. After several attempts, and considerable help, he succeeded, and with assistance he reached a box stall. He immediately went down again, and was completely paralysed in the hind parts. For about six hours he lay comparatively comfortable, when he commenced to struggle, striking out violently with his fore feet, pounding his head, and otherwise showing intense agony. He was raised in slings, but he could not use his hind limbs, and, after brisk rubbing for half an hour, he was lowered upon a good bed.

My prognosis was favourable. The treatment consisted of the administration of soda bicarb., salol, and cannabis indica, with ½ oz. ether nit. every four hours during the day, and once or twice in the night. He was allowed all the cold water he would drink, but no food. After the second day he commenced to use the posterior limbs a little, and on the morning of the third he was on his feet, and, having broken open the door of the stall, was walking about the stable.

Three days later he was apparently as well as ever except for a bruised head and a greatly swollen carpus, which eventually suppurated. Later he was returned to his accustomed work, which he performed satisfactorily in every respect.

After about a month, the owner, on going to the stable one morning, found him down, and unable to rise, and, deeming him incurable, destroyed him. During the previous evening the owner had driven him 5 or 6 miles, during which time he appeared unusually vigorous, and could be held in only with effort.

The important points in this case were: (1) The gradual development of the symptoms. (2) The partial recovery and then complete paralysis after moving. (3) The extreme restlessness, no matter in what position the patient was placed. (4) The extreme old age of the patient.

PSEUDO-LUXATION OF THE PATELLA IN A HORSE, AND TRUE LUXATION OF THE PATELLA IN A DOG.

BY C. H. CASE, AKRON, OHIO.

(1.) Pseudo-Luxation of the Patella in a Horse.

In the *American Veterinary Review* for March, 1907, there is an illustrated article by W. L. Williams, entitled "The So-called Upward Luxation of the Patella Over the Internal Condyle of the Femur," in which it was attempted to show that such a dislocation or "hooking fast" was impossible, and that the condition known by that name requires some other explanation. We were recently called to attend a case of this character occurring in a mare aged 5, weighing about 1,500 lbs., which had been purchased by the present owner a week previous to the advent of the difficulty, at which time she was in prime condition. The new owner worked her for two days, after which she was permitted to stand in the stable for three days because her services were not needed.

The first time she was taken out again she promptly developed azoturia without going down, but while she was able to stand she progressed slowly, being unable to bear any weight upon the right hind leg. After three days she was able to walk home, a distance of eight-tenths of a mile. Some hours later, it was discovered that the left hind limb, upon which she was bearing most of her weight, and had been for three days, was immovable and apparently riveted to the floor. When the animal was forced to move, the affected limb was dragged rigidly behind. The application of the whip relieved the difficulty at once, but ten minutes later the condition had returned. Again the whip was applied with prompt relief, and the patient was then exercised for half an hour, when she was put away for the night. On the following morning the condition had again returned, when the whip was again applied and the animal exercised for two hours, after which she remained normal until evening, when it was necessary to again apply the whip, after which the difficulty did not recur, and the animal was returned to regular work without further difficulty.

We had here a case presented which was thoroughly typical of the so-called "hooking fast" of the patella by means of its ligament over the internal femoral condyle. In each case it was relieved by the whip. The relief continued so long as the animal was exercised, no matter what the gait. The condition recurred for the fourth time, so that, according to some authors, it might have been termed "habitual dislocation of the patella." The difficulty always appeared when the animal was standing quietly upon the affected limb. There was at no time any swelling, inflammation or lameness in the part, and no trace of disease remained to indicate that any ligament had been strained or injured in any manner. The case, in so far as one could do, supports the contention of Professor Williams that the disease is not a dislocation in any sense, but the result of a muscular cramp due to long standing upon the limb.

(2). Luxation of the Patella in a Dog.

A common cur weighing about 10 lbs., jumped from the shoulder of its owner, a young girl, to the floor, and started to run away, when it commenced to yelp and held the hind leg rigidly flexed forward beneath the body, and could not put the foot upon the floor. The patella could be plainly felt dislocated outwardly. By forcibly extending the leg, the patella returned to its position with an audible snap, and the dog at once travelled normally.

A few hours later he was returned to us in the same condition, the dislocation was again reduced and the patient once more sent home. The condition continued to recur three or four times a day, accompanied each time by the yelping and the carrying of the leg flexed forward under the body, but the girl owner, having learned now to replace it, did so as often as the accident recurred. The dog was very playful, however, and was continually jumping on chairs or into the laps of members of the family, which movements repeatedly caused a recurrence.

He was then removed to our premises and confined in a cage, where, during a period of four days, the accident occurred but once. The patella region was blistered with iodine. After this four days of confinement, he was again taken home and the blistering continued, but the accident recurred occasionally when the animal jumped upon chairs, but was promptly replaced each time by the owner, until finally, after a week, the accident ceased to recur and the recovery became permanent. This true luxation presents a marked contrast to the preceding case.

(1) The dislocation in the dog always occurred during violent exercise, while, in the horse, the so-called dislocation always occurred while the animal was standing.

(2) The true dislocation in the dog caused unmistakable evidence of pain as soon as the accident occurred, whereas in the horse, so long as the patient was allowed to stand still no evidence of pain was apparent.

(3) The dislocation in the dog was evident to vision and to palpation; in the horse no displacement was recognizable.

(4) In the true dislocation in the dog, the limb was carried forward beneath the body; in the horse, the limb was extended backward when the animal was forced to move.

(5) Sudden forced movements of the horse overcame the difficulty; sudden forced movements of the dog induced it.

REDUCIBLE TORSION OF THE UTERUS IN A COW.

BY C. H. CASE, D.V.M., AKRON, OHIO.

The patient was a cow, aged 6, weighing about 900 lb., and had reached the normal duration of pregnancy. One week previously the owner had separated her from the other cows of the dairy, because he believed that she would calve during the night. At this time she was apparently well in every respect, and showed all the general symptoms of early parturition, including a tensely filled udder and much-swollen vulva. She continued apparently well for three or four days, when

her appetite began to fail, and the owner, believing that she was suffering from indigestion, administered 3 lb. of Epsom salts and a quart of raw linseed oil, which produced free purgation, but no relief in the symptoms. The swelling of the vulva receded, and milk drawn from the udder had a very disagreeable odour.

The animal was found lying down, groaning and tympanitic. When made to rise she did so with difficulty, owing to great weakness. The mucosa of the vulva was intensely injected and dark coloured, with but little swelling. The animal was dull, weak, tympanitic, with complete loss of appetite, groaning, and grinding of the teeth. Manual exploration of the vagina showed its walls thrown into spiral folds, through which the os uteri could be reached and felt, but only one finger could be inserted into it.

Examination *per rectum* revealed a torsion of the uterus to the right. The cow was secured, and the rolling method applied abundantly without producing any relief in her condition. Owing to the weak condition of the cow, it was deemed inadvisable to attempt reduction of the torsion by laparotomy or other procedure, and the cow was destroyed.

Upon opening the abdominal cavity, it was found filled with a large quantity of reddish fluid. There was a complete torsion of the uterus from left to right. The uterine cavity was greatly distended, and the walls of the uterus greatly thickened, œdematous, and of a darkened, gangrenous hue. There was a partial transverse rupture of the peritoneal and muscular coats about 10 in. in length. With the uterus completely exposed, it was found very difficult to reduce the torsion when grasping it with both hands, owing to its great volume and weight, as it contained a large male fœtus and more than 10 gallons of fluid. The fœtus was presenting normally, but was œdematous. The condition of the uterus, and the difficulty experienced in reducing the twist when the abdomen had been completely opened and the uterus uncovered, demonstrated how impossible it may be in such cases to overcome the displacement by any form of operation or manipulation.

The torsion was apparently of less than six days' duration, probably about four, and yet the circulation in the uterus had been so acute as to cause the death of the fœtus, accompanied by abundant extravasations of fluids into the uterine and abdominal cavities, uterine walls, and, finally, apparently, a necrosis of the uterus itself.

THE MALLEIN REACTION IN NON-GLANDERED HORSES.

BY HENRY J. SÜDMERSEN, Ph.D., THE WELLCOME PHYSIOLOGICAL RESEARCH LABORATORY, HERNE HILL, S.E.

It has been our custom, at the Wellcome Physiological Research Laboratories, when testing horses for glanders to make quite superficial injections of mallein, and consequently we obtain small transient swellings in normal horses which would not be visible if the injection were made deeper into the subcutaneous tissue. All horses before admission to our stables are tested in this manner, and our experience is that, as a general rule, normal horses show at the end of twelve hours a slight ill-defined swelling (about 2 in. across), which usually

disappears at the end of twenty-four hours. Horses that have satisfactorily passed this test are used for the production of immune sera by repeated injections of various bacteria and their products. After several months' treatment much larger swellings are obtained upon injecting mallein, and the size of the swelling depends upon the degree of immunity to which the horse has attained. In a few instances (3 in some 50 cases) rise of temperature has accompanied the local reaction.

A well immunized horse may give a reaction closely simulating that attained with a glandered horse. In our own experience a well immunized horse was destroyed on account of this reaction, but a *post-mortem* examination revealed no trace of glanders.* In this case a rise of temperature of 2·6° F. was obtained, and the local reaction was a small, sharply defined swelling at the end of twelve hours, increasing to 4 by 8 in., ill-defined on the third day. The test was then repeated with double the dose of mallein, with the result that the temperature rose 2·8° F., and at the end of twelve hours the swelling was 4 in. across, and on the next day was increasing and tender. These reactions were considered quite sufficient to condemn the horse, but the result of the *post-mortem* examination and subsequent experiments on other immunized animals, showed that immune horses must be judged from a different standard from normal horses, for all immune animals give reactions to a greater or less degree.

It seems probable that apparently normal horses may become sufficiently immune, through some previous infection, to give marked reactions to mallein without being glandered. This is known to be the case with horses suffering from purpura.

It is thus a matter of considerable importance from a practical point of view to be able to distinguish between the two reactions—that of an immune horse and that of a glandered horse.

In the first place, immune horses rarely give any rise in temperature (3 cases in 50), and when such a rise does take place the maximum is reached at twelve hours after injection, and the temperature rapidly falls and reaches the normal in about twenty-four hours. Our experience with glandered horses has been that the maximum temperature is not reached until the fifteenth hour, and the fall is only gradual. Out of 26 horses with large local reactions, and which were shown to be glandered on *post-mortem* examination, 19 had considerable increase in temperature (average rise 2·7° F.), while 7 gave very little rise (average 1·1° F.).

The local reaction obtained upon immune horses also differs from that of glandered animals. Although such swellings as "5 by 7 in., well defined," have appeared on non-glandered immune horses at the end of twelve hours, yet these swellings invariably become more diffuse and ill defined after twenty-four hours, and often disappear by the third day. In glandered horses the swelling retains its sharply defined character, while increasing in size for several days.

The production of large reactions upon immune horses is not confined to mallein only, but similar reactions have been obtained with tuberculin, and with other bacterial proteins, such as those obtained from streptococcus, bacillus typhosus, &c.

* The *post-mortem* examination was made by Messrs. Hunting and Humphrey, Veterinary Inspectors to the London County Council.

AN UNUSUAL ACCIDENT.

BY A. W. WHITEHOUSE, LARAMIE, WYOMING.

A TRIFLING misstep on a small obstruction on a level road, rupture of both lateral ligaments of the fetlock, and rupture of the skin with protrusion of the unbroken articular surface of the metatarsus, present a sufficiently remarkable combination to be worthy of record.

The subject was a bay and white skewbald, or "pinto," aged 11, 14.2, in good condition. He was a ride-and-drive livery horse, quiet, trustworthy, and very useful. At the time of the accident he was being ridden at fair trot along a road. To protect a muddy place a number of poles had been laid transversely on longitudal stringers. This was a number of years ago, and the poles had disappeared, one of the stringers being left half buried. This stringer was about 8 in. in diameter, parallel to the direction of the road, and visible for about 4 ft. of its length, at its end standing up its full 8 in. of thickness.

On this obstruction the horse stepped with the off-hind, the foot turning inwards. The road was at this time dry and firm. The case was reported to me by the owner, and I advised destruction without going to see the animal. However, as the accident occurred within the city limits, and the owner put in a claim owing to the obstruction, I was retained by the City of Laramie to investigate the case.

It appeared that the dam of this horse had trodden on his off-hind fetlock as a foal, causing severe lameness, that he had been put in splints, and recovered, with a slight enlargement. It was also clear that he had been used constantly for seven or eight years, and never known a day's lameness.

I found that the horse had been skinned, leaving only the lower lip of the wound, so I sawed through the metatarsal bone, and took the specimen home for dissection.

Skin.—The lower lip of the wound remained; it extended from the middle line in front to the middle line behind, say the outer half; much extravasation and inflammation near the wound. There was a considerable amount of connective tissue adhesion on the inner side, as was to be expected in a horse that had done so much work.

Subcutaneous and Intertendinous Connective Tissue.—This was rather plentiful round the fetlock joint; elsewhere the leg was very clean.

Extensor Pedis Tendon.—This was skinned off and cut just above the fetlock joint. The inner attachment to the capsular ligament was intact, the outer attachment ruptured. The capsular ligament came off with it, a bloody, gelatinous mass. The attachments to the suspensory branches were intact. The whole tendon was pushed to the inner side of the metatarsus, keeping its proper relation to the suffraginis. The quality of the tendon was good.

Perforans and Perforatus Tendons.—The whole course was normal, the quality good.

External Splint Bone.—This was fractured near the lower third. The broken part had been skinned away with the hide.

Suspensory Ligament.—This was normal down to its bifurcation. The inner fork was not ruptured, but much reddened and infiltrated at its attachment to the sesamoid. The outer fork was completely ruptured at its bifurcation, though held, more or less, in place by the intact vessels. Quality good on section.

Sesamoid Bones Intact.—Freshly inflamed on their articular surface.

Lateral Ligaments.—These were both completely ruptured in their middle, the attachments holding. Both were of slightly inferior texture, the fibres being somewhat separated by old scar tissue; but their bulk was very considerable, and it is not clearly apparent that they were weaker than normal ligaments. The ruptured parts were, of course, too short to test by tension.

X Y and V Ligaments and the other parts below the fetlock joint were intact.

Metatarsus.—Just above the internal malleolus was an exostosis as big as a walnut. Just above the external malleolus was a very slight ill-defined exostosis. The articular surface was, of course, intensely reddened and inflamed, with hæmorrhagic infiltration into the surrounding tissues.

Judgment.—I advised the City authorities that there was not enough deformity or degeneration of tissue on which to base a defence. The only marked exostosis was on the inner side, which did not bear the first destructive strain, and the condition of the lateral ligaments was not conclusive. It was probable, I told them, that the horse was more likely to turn his foot, but not at all clearly more likely than a sound horse to suffer such an injury from turning it. The remarkable feature to my mind is the rupture of the skin by the smooth articular surface of the metatarsus. The skin was quite healthy, with no appearance of an old scar. I should add that neurotomy had never been performed, and I dissected out both nerves intact.

CIRRHOSIS OF LIVER IN A HORSE.

BY CAPTAIN W. A. MCDOUGALL, A.V.C., YORK.

An 8-year-old bay gelding belonging to the Royal Field Artillery at Sheffield, was admitted to hospital at that station on January 24, 1908, and when seen by me the next day he presented the following symptoms:—Breathing and temperature normal. Pulse 64 and weak. Jugular regurgitation. Mucous membrane of eye injected—raw beefsteak appearance. An eruption on the skin of the lips, which was very itchy, as he kept rubbing the lips against the wall when not restrained. Fæces hard and dry, and bowels more or less constipated. Urine thick and contained considerable sediment. Stamping of hind feet, especially after urinating. Penis hanging out, but had power to retract it. Not feeding well, but would eat hay. Thirst not excessive. Abdomen rather tucked up. No icteric tinge of the visible mucous membranes. The horse remained in much the same condition until about 8 a.m. on February 6, when his breathing suddenly became very distressed, and those in attendance thought he was going to die of asphyxia. As immediate veterinary aid was required, Mr. Joseph Abson, F.R.C.V.S., was called in, and on arrival about 9 a.m. found the horse *in extremis*. Tracheotomy was at once performed, when the horse became much the same as he was before the attack of dyspnœa came on. There was never afterwards any difficulty in breathing,

and when next seen by me—February 15—he could have done without the tracheotomy tube. The symptoms remained the same all through the illness, except that the horse gradually became more and more debilitated. He was destroyed on February 25.

Treatment.

This had consisted chiefly of efforts to keep up his strength and relieve the constipation, &c., and good nursing.

Post-Mortem Examination.

Peritoneum was a peculiar purple colour. No enlarged glands were detected in abdomen.

Colon.—Contents semi-fluid, mucous membrane purple-coloured, much the same hue as the peritoneum, and in places slight blood extravasation, staining the contents of bowel.

Cæcum.—Condition similar to that of colon.

Small Intestines.—The same purple colour of mucous membrane, only not so evenly diffused as in large intestines—it was more patchy; contents fluid.

Stomach.—Full of dry food; cuticular portion normal in appearance, villous portion normal in appearance, except that there was tendency to purple colour already mentioned.

Liver.—Lighter in colour than normal, and hard and firm; there was a condition of cirrhosis involving the entire gland.

Spleen also in condition of cirrhosis.

Kidneys rather flabby.

Heart muscle also flabby.

Bladder.—Normal, but the urine present contained considerable sediment.

Throat.—Trachea and larynx normal.

Lungs.—Normal. A few round worms in large intestines.

A CASE OF MESENTERIC ABSCESS. A CORRECTION.

In the interesting clinical article by Captain Pallin on the above subject in the Veterinary Journal for March, the date of admission of the patient to hospital, suffering from strangles, should have read May 6, 1901, and not May 6, 1900. We regret the oversight.—Ed. V. J.

Abstracts and Reports.

PREVENTIVE INOCULATION FOR "LUNG SICKNESS."*

BY W. ROBERTSON, M.R.C.V.S., F.R.S.E., DIRECTOR OF THE VETERINARY LABORATORY, GRAHAMSTOWN.

ACTING upon the well-known fact that many of the acute diseases of animals occur only once in a lifetime, and that animals once having safely passed through these are less liable to future attacks than others not so circumstanced, the principle or practice of protective inoculation has been based. By protective inoculation is meant the production artificially in the animal of a state of disease which, while modified so that it shall not endanger life, is yet of such a character that its existence shall confer an immunity more or less perfect from future attacks, similar to that which follows an attack of the disease caught through the ordinary channels of infection. This definition of protective inoculation, though the one ordinarily received as correct, is scarcely a statement of the conditions which in many instances we observe to exist. Protection, it is probable, may be conferred on animals against the attack of the natural or inoculated disease, where the protective inoculation has not induced any disturbance sufficient to entitle us to say that disease has been induced, all that we are entitled to say being, that an impress, or power of resistance, has been by our protective inoculation conferred upon the animal against the natural attack of the disease.

Protective inoculation may be secured by several methods of treatment of the virus:—

(1) By inoculation with modified quantities of the unaltered virus.

(2) By the same virus being modified by being transmitted through a different species of animal.

(3) By the original virus, changed in character by cultivation at certain temperature, in certain media of culture.

(4) The use of the media in which the virus has been grown and in which the essential organisms have been killed, but which contains the result of their growth (just as the yeast fungus, *S. cerevici*, grown in sugar solutions, yields alcohol).

(5) By heating the unaltered virus or adding to it certain chemicals.

(6) By the use of the virus of another disease.

Before the past twenty years protective inoculation had not had practical application in man or animals, except with regard to smallpox in the former and lung sickness in the latter, and protective inoculation for certain specific diseases of the animals of the farm has only attracted attention within comparatively recent years, and may be said to have originated with the recognition of the specificity of such diseases, *i.e.*, of their being the result of the entrance into the animal system of specific micro-organisms, and not as formerly considered as an infringement of dietetic or sanitary laws. That the entire class of specific infectious diseases to which the animals of the farm are liable may be largely controlled as regards their distribution is now scarcely doubted. Their ultimate suppression is more questionable, seeing the great difficulties which beset the carrying into operation of these

* From the *Agricultural Journal*, Cape of Good Hope.

measures which science and experience have now stamped with their approval. As measures rightly belonging to sanitary police are not the text of this article, I will pass on to give somewhat in detail those methods of inoculation which have been devised with respect to the more important of these diseases.

Lung Sickness or Pleuro-pneumonia Cont.

This contagious fever of cattle has proved—not excepting rinderpest—one of the greatest setbacks to cattle farming in this country. It is characterised by an uncertain period of incubation, by its difficulty of detection during the early stages, and by its tendency, through particular changes in the lung tissue affected, of retaining, even in animals apparently recovered, the power of conveying the disease to clean stock. It is not necessary to go into the clinical symptoms or *post-mortem* appearances of lung-sickness in this article (see article on "Lung-sickness in Cattle" in February number *Agricultural Journal* for 1901). As a means of protecting cattle from this disease, Dr. Willems, of Hasselt, Belgium, in 1850, first advocated and carried out the inoculation of healthy animals with the clean fluid from the lung of a sick beast; but there seems little doubt that, though to Dr. Willems belongs the credit of first employing the inoculation on a practical scale, the method was known as early as 1820, when it had been attempted by Kersman and Hausmann, of Hanover, and it is this system of inoculation which, with certain modifications, is in use at the present day, and has proved of the utmost value in Europe, Australia, and the Cape of Good Hope. The chief objection which has been urged against the adoption of protective inoculation for lung sickness is, that the dangers of propagation of the disease are increased by the inoculation of hitherto healthy cattle; that is, that inoculation in the tail of virus from the lung of a diseased beast can produce lung sickness in a clean animal. The large majority of European experts express a confident opinion that you cannot communicate the disease in this way, but Hutcheon (Annual Report for 1887, and *Agricultural Journal*, vol. v., p. 251) says: "I am thoroughly convinced that inoculation is capable of communicating lung sickness direct to a healthy susceptible animal. I am quite ready to admit that such cases are comparatively rare, but that they do occur and are the means of introducing the disease into a previously healthy herd I entertain no doubt whatever, and it does not appear so improbable that such cases should arise under special circumstances. It is a well-established fact that if an ox which has been inoculated or drenched as a preventive of lung sickness is operated on for any other cause or receives any external injury during the time that the specific virus is circulating in the blood, specific local swellings are liable to occur at the seat of the injury, proving fatal in many cases."

Selection of the Virus.

In the fluid the material for inoculation purposes is, or rather should be, taken from the clear, straw-coloured fluid distending the interlobular septa of the affected lung. The case should not be one of long standing, nor should the virus be taken from a lung which shows lesions of a tubercular or putrid character; any which becomes contaminated with blood should be discarded. Good lymph, says Mr. Rutherford—an

authority on the inoculation in Europe, and one of the early workers to place the operation upon a firm basis—is only to be obtained from *salmon and brick-red portions of the diseased lung, never from portions which are black in colour.* The clear liquid should be collected from the lung tissue with a clean boiled teaspoon, and put into a clean boiled bottle, with one-twentieth to one-tenth (according to the atmospheric temperature) of its bulk of glycerine. When the weather is cool, lymph thus selected may be kept fit for use over a week, probably longer. This method, though capable of doing good work, has much to be said against it; suitable lungs are sometimes rare, and owners frequently wish to inoculate their cattle far from a centre of the disease. In 1888-89, Dr. Germont and Mons. Loir, while working on behalf of the Queensland Government, found that the injection of small quantities of lung-sick virus under the skins of calves produced a large subcutaneous fluid swelling (œdema), and that this fluid made an excellent material for protective inoculation. It is on similar lines to these that the lung sickness virus sent out from the Veterinary Laboratory, Grahamstown, is prepared. After a considerable experience with this method I find many discrepancies between the report of Dr. Germont and Mons. Loir and my own experiences. These workers find that the injection of 15 drops of virus produces a swelling extending from the dewlap to the groin, and that such a result is practically certain. As will be seen, my experience (running to near 300 inoculated animals) does not quite tally with this.

Preparation of Calf Lung-Sick Virus.

For this work I prefer young oxen about 2 years old, and they *must* be in decent condition, with the skin loose and health good (lean, starved calves are useless), and, if possible, free from ticks; the subcutaneous irritation set up by their attacks render the subsequent virus discoloured. I receive the virus from the field staff in 1 oz. or 4 oz. bottles, mixed with one-tenth its bulk of glycerine. These bottles are sent out from here sterilized. Sometimes I receive consignments of pleural fluid which, in a certain percentage of cases, produces good results. The cattle are sprayed on arrival, and, if infested with ticks kept for a fortnight. The inoculation is generally made in the dewlap, and I find invariably that less than 15 cc. of virus is useless. The animal is then placed in a pen, and the dewlap commences to show a swelling in from three to five days, reaching its maximum on the eleventh to twelfth day. I have never seen good results after that time. As a result of the virus inoculation, one of three things may happen (I exclude the chance that the animal has a natural or acquired immunity, in which case nothing occurs): (*a*) The swelling may gradually increase in size and run along the dewlap, and on pressure gives the sense of fluid in small separate compartments, which can be broken down by firm pressure; this is the condition desired. (*b*) The swelling may become hard, and remain, as it were, a local lesion; on section an appearance resembling dry gangrene is met with, in some cases there is a putrid odour, but generally no smell; this lump breaks down, an abscess forms, and the animal frequently dies from exhaustion and poisoning. (*c*) The lesion may become general, *i.e.*, the animal, though showing little or no lesion at the point of inoculation, becomes stiff, particularly in the fore limbs, and in a few days—quite unable to stand

—has distinct shivering fits, loss of appetite, and a temperature running up to 106° F., the animal groans, and is evidently in much pain. Death generally occurs in such cases from the eighth to the twelfth day. On *post mortem* the whole of the areolar and intermuscular tissue of the body appears to be charged with clear yellow fluid or jelly; this is most noticeable in the layers of the diaphragm and the intermuscular septa of the muscles of the thighs and neck. The subscapular and superficial and deep inguinal lymphatic glands are enlarged, frequently to four times their normal size, and very juicy; in five instances I have seen areas of hæmorrhage. The lungs are *never* affected, but all the joints of the body contain much more fluid than is naturally present, and this fluid, whether in joints or intermuscular tissue, produces typical reactions when inoculated into the tail of a clean beast. If the result of the inoculation into the dewlap is satisfactory, the animal is killed on the ninth or tenth day, and thoroughly bled, the hair over the area is shaved, all instruments, &c., being boiled, and only boiled water used (I never employ any disinfectant or antiseptic in this work), the skin is incised with a sharp knife and stripped downwards to make a pocket, into which the virus collects: to assist this flow the operator slashes the subcutaneous tissue with a sharp knife, the virus is removed with a sterile spoon, filtered through boiled muslin, and then has added 10 to 25 per cent. (depending upon the temperature) of a mixture of pure glycerine and water (equal parts), to which is added ·5 per cent of pure carbolic acid. The yield of the material from the swelling varies, 600 to 700 cc. is a fair average, and the record from one ox was 2,200 cc., that is, crude material without addition of preservative. The virus is issued fresh, all over twelve days old being destroyed, and is sent out in various sized vials as required; 2 cc. will easily do five cattle; with the virus is sent out sterilized Berlin wool threads.

Method of Inoculation Practised.

In this country the method generally practised is to soak the thread in the virus and insert it under the skin of the animal's tail, about 6 to 9 in. from the tip. In the early days of inoculation for lung sickness complications and deaths were far from uncommon; now, although in principle, general character, and mode of application, the primitive mode of Dr. Willems (with the modification of the virus recommended by Dr. Germont and Mons. Loir) is still carried out, attention to details in its performance, as well as to the conditions intrinsic and extrinsic which are brought to bear upon the animals operated upon, while not lessening the protection conferred have enormously reduced the complications and mortality. As already stated, although the charge has been made that inoculated animals are liable to become centres of infection and, consequently, to propagate the disease, I am satisfied, not from personal experience, but judging from the testimony and mass of evidence submitted by several independent authorities, that this cannot be substantiated. The chief effects produced in the inoculated are local, *i.e.*, confined to the seat and vicinity of the operation, and rarely of a general or constitutional character, and there is no doubt that immunity or protection can be conferred without even the evidence of local œdema or inflammation, and from my experiments on the subjects I incline to the belief that

the œdema, following the local inoculation with the virus of the disease, is dependent upon the presence at the point of puncture of certain bacilli, which are frequently found in association with the special or casual micro-organism of lung sickness. These bacilli are always found in greater or less quantities in the ordinary virus, and although they do not appear to be the true organisms of lung sickness, they may be the cause of the phlegmonous inflammation which occurs after ordinary inoculation. The period over which the local effects of the operation extends is from the fourth to the twenty-third day: these figures are quite empirical, so many factors have a governing influence over the inoculation. In cases where local phenomena or local reactions are noticed (for, as already noted, the appearance of these is not absolute or invariable), we find that from the fourth to the seventh day there is swelling of the tail, with appreciable increase of heat and pain on pressure; a few days later the tail becomes stiff and an exudation of amber-coloured fluid is found around the seat of inoculation. In favourable circumstances these lesions disappear entirely in a couple of weeks. All cases, however, do not proceed so favourably, and although a fatal result is rare, recovery may be delayed. Here the swelling at the end of the tail persists, and death of a portion of that organ ensues, chiefly owing to the plugging of the blood-vessels and the stoppage of the supply of nutrition, the part becomes cold and gangrenous and eventually drops off, leaving the animal with a shortened tail. Sometimes the gangrenous changes appear to invade the body, the glands at the root of the tail become swollen, and abscesses appear in the region of the buttocks, and even in the pelvis itself. In such a case amputation of the gangrenous part of the tail should be carried out without delay, and amputated close enough to the sound tissue to draw blood.

Notes on above Work.

This work is, of course, empirical in the truest sense of the word, in that we do a certain thing with the prospect of a definite issue, but are unable to explain the reasons for such results, and, as might be expected, curious features present themselves. Though much depends upon the quality of the crude lymph for a successful issue, a considerable factor towards success or failure is to be found in the calf. Calves, or rather, what I prefer to use, young oxen, vary in susceptibility in a most extraordinary degree. Using the same bottle of crude virus on three animals, one might get a good result and two failures, or *vice versâ*. I have tried inoculating in all parts of the body and get best results from the subcutaneous tissue of the dewlap. During my work on this subject I have *endeavoured to produce the disease by inoculation* and in *every instance have failed to do so*. I do not consider that the œdema set up at the point of local inoculation of the virus, the general muscular and joint œdema sometimes following the subcutaneous inoculation of the material into calves, or the abdominal œdema following a certain percentage of drenched cases, in any way approximates to the true lung lesion met with in natural cases, and I am inclined to the theory that it is the allied organism, met with in the virus, which produces the manifestation following inoculation, rather than the action of the causal organism of lung sickness. The contagium or living cause of lung sickness belongs to what, in bacteriology, are

termed *ultra-visible contagiums*, and is one of the smallest organisms of which we have any knowledge, it being just visible with the highest powers of the microscope.

It is also curious in that it can pass through the pores of a Berkefeld filter, which keeps back the great majority of germs. If the virus is filtered the lung sickness organism passes through, but this filtrate will not, so far as I have worked with it, produce local reaction in tails when injected under the skin of susceptible animals; other animals in the same herd show reactions to the ordinary virus as issued.

Artificial Virus.

The discovery of the first causal organism of lung sickness, and subsequently of the fact that it could be cultivated in artificial media outside the animal body, set many investigators to work to discover, if possible, some means whereby an artificial vaccine, capable of giving protection against the disease, might be produced. It was found that the organism grew best in a broth made from pigs' stomachs to which had been added horse serum. The virus from the lung and the pigs' stomach broth are mixed together and filtered. Only the organism of lung sickness passes through; this is bottled in tubes, to which is added the horse serum, and incubated. If the organism grows the media becomes cloudy, the tube is hermetically sealed and sent out. The method of inoculation is by a syringe, and the seat under the skin of the tail. I may say that I have failed to obtain any sort of satisfactory result with this inoculation; it may be that immunity is produced, but I doubt it.

During this work I have repeatedly endeavoured to infect animals, that is, produce some semblance of the natural disease with the virus, crude and prepared, and signally without effect, though large quantities have been injected into the lungs direct, blood-stream, and abdominal cavity. The important and practical outcome of all that has been stated appears to be capable of being formulated in the two concluding statements:—

(1) That, according to the experimental teaching of operators in this country, and of a large number on the Continent and our other colonies, it is as stated, "that experimental proof is abundantly forthcoming that it is possible to invest animals with immunity against lung sickness (*pleuro-pneumonia contagiosa*) by inoculation with the virus of the disease."

(2) That, so far, the evidence is against the fact that, as stated by some observers, this inoculation can produce the disease in inoculated animals, but that rare instances of infection may possibly occur.

THE THERAPEUTICAL PROPERTIES OF CALCIUM SULPHIDE (CaS).*

BY J. M. RICE, BOBCAYGEON, ONTARIO, CANADA.

Calcium sulphide is an amorphous powder, greyish-white in colour, with a disagreeable but characteristic odour. It is insoluble in water, and alkaline in its reaction.

Calcium sulphide begins to decompose very shortly after it is

* Read before the Ontario Veterinary Association.

taken from the utensils of manufacture, the rapidity depending upon the amount of non-saturated air with which it comes in contact. The oxygen in a well-filled, tightly corked bottle is sufficient to weaken the top layer, and occasional opening to use will weaken the remainder. When mixed with boiling water it is decomposed into calcium hydrate and sulphuretted hydrogen. When mixed with cold water the carbonic acid liberates the sulphuretted hydrogen, leaving calcium carbonate. Very weak solutions of mineral acids also decompose it. The residue of that part of the drug which is decomposed in the stomach or intestines is absorbed, as well as the undecomposed portion, each of which is of therapeutic value, the undecomposed portion being the more active. When absorbed it is broken up by the tissues, part of it appearing as hydrosulphuric acid eliminated by the lungs and skin. The urine also contains an excess of sulphates and sulphuretted hydrogen.

To obtain the best results from calcium sulphide, it ought to be given when the acidity of the stomach has been reduced or made alkaline, in which case the undecomposed drug would nearly all pass into the blood and other circulating fluids to permeate and disinfect the entire system.

During its elimination by these various organs, it stimulates their functional activity ; when excreted by the lungs the respiratory mucosa is stimulated and expectoration favoured. It also acts upon the sweat glands, whose excretions are stimulated and increased.

On the kidney it produces diuresis by the action of the sulphates and sulphuretted hydrogen. In general it produces an increased activity of the circulation and an increase of appetite.

Calcium sulphide appears to prevent and arrest suppuration. The toxins produced by the various zymotic diseases are neutralized by the presence of hydrogen sulphide in the blood, or possibly the leucocytes are stimulated to unusual vigour and their phagocytic power greatly increased.

If calcium sulphide is given in sufficient doses to produce saturation, it renders the life and activity of many micro-organisms inert, either by killing them or by inhibiting their growth. The cessation of suppuration, which coincides with saturation, indicates that all ordinary pyogenic bacteria are probably destroyed or their activity greatly diminished by it. It is very useful in metritis, metro-peritonitis, pyæma, septicæmia, sapræmia, furunculus, wound infection, acute mammary and other abscesses, strangles, influenza and other inflammations of the respiratory tract, open synovial cavities and all forms of suppuration.

To get good results, it should be given in medium or large doses, and repeated five or six times per day until saturation is produced, when the breath and skin of the patient will smell strongly of hydrogen sulphide. For laryngitis and pharyngitis it may be given in solution, which will more or less bathe the parts.

It is also useful to abort commencing febrile diseases. In various skin diseases calcium sulphide has been used locally, forming an ingredient of the well-known and famous Vleminckx solution. It is used by some practitioners of human medicine for the treatment of diphtheria, in doses of ½ grain, repeated several times daily.

Doses : For horses and cattle ... ... dr. ½ to 2.
Dogs ... ... gr. ½ „ 1.

Larger doses than these may be given without danger, I having often administered as much as 4 drams without harm.

The most successful methods I have found of administering this drug is either in a capsule or raising the horse's head as if for drenching, placing the powder well back upon the tongue, and pouring a little water into the mouth, thus producing deglutition. The latter is probably the best way for the attendant to administer it.

As a general rule, it cannot be so successfully given in a drench because of its insolubility, and also when mixed with water it becomes decomposed, the hydrogen sulphide escaping.

Considerable quantities of sulphuretted hydrogen may be disengaged in the stomach and absorbed without causing any deleterious action on the red blood cells, but, if taken in through the lungs, it unites with the hæmoglobin, reducing it to methæmoglobin, and this union, once formed, is exceedingly difficult to break up.

Respired in quantity, hydrogen sulphide has caused death in man from rapidly induced asphyxia; this has led to timidity in the use of the sulphides, preventing the demonstration of their therapeutic possibilities.

Reviews.

TEXT-BOOK OF COMPARATIVE GENERAL PATHOLOGY. By Professor Dr. Thomas Kitt, of Munich. Translated by Dr. W. W. Cadbury. Edited by Dr. Allen J. Smith (University of Pennsylvania). 472 pages, 132 illustrations and 4 coloured plates. London: Baillière, Tindall and Cox. Price 25s. net.

THIS book, emanating from the able brain and pen of Professor Kitt, comes as a boon to the veterinary student, who has up to the present been handicapped in pursuing his studies in this subject by being forced to rely for his instruction on lectures, and on the bald and often scarcely readable notes which he has been able to make. As regards a text-book on the subject of General Pathology, he had none to refer to except works on Human General Pathology. As a book of reference the work will prove invaluable to the practitioner of veterinary medicine, as being the only work which presents the pathological facts and theories as accepted to-day.

To the student and practitioner of human medicine the book should not be without interest, seeing that the two branches of medical science are so closely allied and dependent the one on the other; and although much of our veterinary knowledge has been derived from the older branch, yet human medicine has advanced by leaps and bounds as the result of observations performed on animals.

Hence the work is one of all-round interest, and its value is enhanced by the occasional addition to, and criticism of, the original text by the American translator and editor, who, though recognizing the sufficiency of the work for the purpose for which it was intended, have ventured to include certain notes which often throw considerable light on the text.

The nomenclature varies little from that generally accepted by

British pathologists, but there are a few notable exceptions, the most glaring, perhaps, being the gross misnomer "Symptomatic Anthrax" as a synonym for Black Quarter. It is a matter for regret that this misleading title appears in a work which will have such a wide influence.

To arrange the subjects included under the heading of General Pathology in such a way as to read consecutively is the work of an expert, and Professor Kitt is to be congratulated on the admirable clearness with which he has grouped and divided the subjects into chapters, leading on from one to the other in natural sequence.

The "Introduction" is taken up with the definition of Pathology, its divisions, sources, and importance, and differentiates between the use of the terms disease, sickness, indisposition, injury, &c.

The second chapter provides interesting reading. In it the author traces the history of Pathology from the time when the Babylonians, Persians, and other early nations practised the healing art. In these early days it was much influenced by superstition and mysticism, and made little progress till the fifth and fourth centuries B.C., when such familiar names as Hippocrates II. and Aristotle occur in connection with it. It was about this time that animals were first dissected for inference to the supposedly similar structure of the human body, while the Greek and Roman libraries of the day contained profuse literature on the subject. It is interesting to note that about this time veterinary medicine was practised, to some extent, by men who may be considered as the prototypes of the modern veterinarian, and who were called "physicians of domestic animals," but in the main it was in the hands of shepherds and farmers.

Medical science was involved in the general collapse of the sciences which occurred in the Middle Ages, and we read of little progress for many years. From the thirteenth century down to the present day medical science has progressed steadily, but it is only within comparatively recent years that Veterinary Pathology has taken its proper position in the consideration of the medical world.

The student who has had to rely on his incomplete notes in his study of this subject, will find reading becomes a pleasure when even the driest facts and theories are presented in such an interesting manner as we get in Dr. Kitt's book.

Predisposition to disease is dealt with in all its complexities. Immunity and Ehrlich's theory are viewed in the light of modern discoveries, and protective inoculation is considered. Brief accounts are given of the congenital and hereditary diseases.

The pathological influences causing disease are classified as follows:—(1) Disturbances of Nutrition and Alimentation; (2) Obstruction to Respiration; (3) Functional Disturbances; (4) Thermic Influences: (5) Electrical Agencies; (6) Mechanical or Traumatic Agencies; (7) Chemical and Toxic Agencies; (8) Microbic Agencies; (9) Animal Parasites. Each of these factors is treated with brevity, but the information is complete, and especially valuable is the discourse on the popular theory of "catching cold." The author clearly demonstrates that this factor is not without its importance in the causation of disease, but that it is not of such pathological importance as the lay public ascribes to it.

The course and termination of disease receive attention in a long

and interesting chapter, which includes a differentiation of the modes by which death is brought about, and a description of the signs of somatic death.

Circulatory disturbances come next under the consideration of the author, and, in the fifty odd pages devoted to them, are rendered lucid by the numerous illustrations which occur.

"Fever is a state of the body in which, because of some disturbance of metabolism, the regulation of the body temperature to a mean level has ceased." That many varieties of micro-organisms, on gaining access to the body, give rise to an increased temperature, is a fact generally recognized even by the laity, and it is no secret that bacterial products, apart from the presence of the organisms themselves, will give rise to hyperthermia when introduced into suitable subjects—*vide* the mallein and tuberculin tests; but that pure distilled water, when introduced into the veins, will cause a rise of temperature, is a phenomenon which will be read of with surprise by the majority of readers, and it is certainly one of the most startling facts which are presented to us in connection with the intricacies of febrile conditions. The series of processes which are collectively spoken of as "inflammation" form a subject of perennial interest to the pathologist, and it is refreshing to trace the course of the phenomena as outlined in a new book; the unaccustomed wording throws new light on a familiar subject. The degenerations are pathological conditions which are of the nature of metabolic disturbances, and are of standard significance, and the work in question contains little that is new and original regarding them. The same may be said of the tumours, with the exception of those included under the comprehensive term "cancer." Professor Kitt goes thoroughly into the theories of the ætiology of this terrible scourge, its dissemination in the body, the predisposition of certain organs, metastasis, histology, and the thousand and one important questions on which much light has been thrown by the investigations of recent years.

The concluding chapter is devoted to a consideration of "Functional Disturbances," namely, of the sensory, alimentary, urinary, and sexual systems.

Besides the numerous excellent illustrations throughout the book, there are four coloured plates, which are realistic pictures of the lesions which they depict. The work is produced in an excellence of style which leaves nothing to be desired.

THE REGISTER OF THE ROYAL COLLEGE OF VETERINARY SURGEONS.

The Register of Veterinary Surgeons for 1908 is now to be obtained, and is improved considerably over the Register of former years.

No effort has been spared by Mr. Bullock to bring the present issue up to date in all its details. The list of members and existing practitioners no longer contains the names of long since deceased gentlemen, and is a reliable account of existing veterinary surgeons and their whereabouts. Several important additions have been made, and account for an extra twenty odd pages. There is a list of the members admitted since the last issue. Another innovation is the list of the holders of the Highland and Agricultural Society's certificate other than members of the Royal College of Veterinary Surgeons. The revised edition also contains the Report of the Council of the Royal

College of Veterinary Surgeons for the year 1906-7, including the financial statement.

The importance of these improvements cannot be overrated, and the thanks of the profession are due to the secretary for the trouble he has expended in getting together the necessary information. The responsibility of reporting alterations of address and omissions rests with the members, and if this duty is faithfully discharged the Register will maintain its present standard of efficiency.

TUMOURS, INNOCENT AND MALIGNANT: THEIR CLINICAL CHARACTERS AND APPROPRIATE TREATMENT. By J. Bland-Sutton, F.R.C.S. (Surgeon to and Member of the Cancer Investigation Committee of the Middlesex Hospital). Fourth edition, 675 pages, 355 engravings. London: Cassell and Co., Limited.

Tumours, like the poor, are always with us, and provide many interesting problems for solution by the pathologist and for treatment by the clinician, and any work which throws more light on the subject will be welcomed alike by the practitioner and the student. In the work under notice are set forth the conclusions of one who for nearly thirty years has devoted himself to the study of tumours, and the result is a comprehensive survey of this wide subject. Since the first edition of the work in 1903 much admirable work has been done in the histology of tumours and in the origin and metastasis of cancer, and all the most recent hypotheses are set forth in these pages.

The term "tumour" was originally applied to many abnormal growths which are now known to be of an inflammatory nature and caused by micro-organisms, and while clinically it is sometimes convenient to describe such as tumours, the work under notice deals only with tumours recognized as such by pathologists, and, in the absence of any knowledge as to the causation, are classified according to their histology. They are found to consist of tissues normally existent in the animal body, and their structure determines their situation, and so, as the author informs us, ". . . . the histology and embryology of an organ enable an experienced oncologist to predict the various genera of tumours and cysts to which it may be liable . . . . nevertheless, the most careful study of the minute structure of such organs as the salivary glands would not lead us to suspect their liability to pure chondromata; and it is strange they should occur in the parotid, submaxillary, and lachrymal glands, and yet be unknown in the pancreas."

The subjoined is the plan of classification adopted by the author:—Group 1.—Tumour. Diseases of the connective tissues, including lipomata, chondromata, osteomata, myelomata, sarcomata, myxomata, myomata, neuromata, angeiomata, endotheliomata and uterine fibroids. Group 2.—Tumour. Diseases of teeth, odontomata. Group 3.—Epithelial tumours, carcinomata, adenomata and papillomata (warts.) Group 4.—Tumours arising from the fœtal membranes, chorion-epitheliomata (deciduomata.) Group 5.—Teratomata, dermoids, embryomata. Group 6.—Cysts.

The division of tumours from very early times into malignant and benign is sound, for "the baneful effects of innocent tumours depend entirely on their environment, but malignant tumours destroy life, whatever their situation."

Dealing as he does with tumours from the point of view of human

pathology, Mr. Bland-Sutton describes varieties which have, as far as we know, no analogues in the lower animals, but the veterinary surgeon will find much interesting and instructive reading in the book. There are frequent references to the occurrence of tumours in animals, perhaps the most interesting of which is a description of mastoid teeth, or dentigerous cysts, in the horse, illustrated by a photograph of the excellent specimen in the Museum of the Royal Veterinary College, London.

The cancer occupies the position of supreme importance among the tumours on account of its progressive and irresistible destructiveness and its metastatic tendencies. Although the disease has been recognized since the earliest times, to quote the author, "the cause of cancer and sarcoma remains a riddle, but let us hope that this riddle is one which will be read, and read speedily." Many hypotheses have been advanced within recent years, but experiments conducted with a view to elucidating the mystery have till now yielded negative results. The theories as to the cause, which are of sufficient importance to merit consideration, are the embryonic, the parasitic, and the biologic. These theories are stated, and the pros and cons regarding each discussed. The variations in the histology of these tumours and the organs involved are matters considered at length by the author, who further adds a few remarks on the treatment of the malignant tumours, which, briefly summarized, amount to this, that surgical interference properly carried out is curative in certain cases where the tumour is in an operable situation and of recent growth; that exposure to the X-rays or to radium will certainly cure superficial growths, but cannot be used for deeply placed tumours on account of the injury to the skin which would result, and that the more recent experiments of Dr. William Coley, based on his observation that a streptococcus was the toxic principle, have yielded in some instances brilliant results, but that the majority of cases are beyond the pale of any treatment except the judicious use of palliative agents.

The medico-veterinary world is indebted to Mr. Bland-Sutton for a valuable addition to its literature. The work is written in a style which makes it interesting reading; it is illustrated by numerous admirable engravings, and its production by the publishers leaves nothing to be desired.

Translations and Extracts.

A CASE OF TRUE LUXATION OF THE PATELLA.

BY M. PAUL HANN, ASSISTANT VETERINARIAN TO THE SECOND DRAGOONS.

THE object of the observation which we relate is to confirm the existence of true luxation of the patella, which certain authors deny or doubt. It relates to a draught horse, aged 10, found one bright morning standing on three legs in the stable. This horse, used only to the harrow, was of a very dull temperament, never played, and had never reared, except at the time of breaking. It was difficult to suppose

that it was at a moment of play or of violent movement that the accident had occurred.

When presented to us he bore his weight entirely on three legs and hopped on his posterior healthy leg, after the manner of a lame dog. The left posterior limb, completely flexed, was carried doubled up under the abdomen and the toe, in place of dragging on the ground (as in the pseudo-luxation or cramp of the colt), was distant about 50 centimetres from the ground. These two symptoms, totally different from that affection, were at once very remarkable, for it is known that the rigid extension to the rear characterizes the hooking fast of the patella. Meanwhile, a more detailed examination permitted us to localize definitely the seat of the affection at the level of the stifle. The region, painful to the touch, presented to us first of all a large, extremely hard cord, extending up the thigh in the direction of the point of the buttocks, and which was no other than the posterior portion of the long vastus, of which the fibres were in physiologic tetanus. The stifle itself was tumefied, tender and deformed, and the patella, completely dislocated outwards, was held in this position by the inferior tendon of the long vastus which terminates upon the external patellar ligament. From the internal side the œdema, perhaps more accentuated, led us to presume the possibility of a complete rupture of the small femoro-patellar ligament. Doubtless, consequently, we had encountered, and this for the first time, complete outward luxation of the patella. The accident could scarcely have existed for more than five or six hours. The reduction of the dislocation was indicated. Our first trials with the hand were in vain ; all attempts to extend the member backward or forward were immediately followed by resistance on the part of the injured animal. We then employed force of the most energetic kind : a side-line was fixed upon the metatarsus, two farriers exerted gradually increasing traction to carry the member backwards ; two other assistants kept the patient from falling sideways, and we ourselves, assisted by another officer, pushed with all our force upon the luxated patella to restore it to its original place. At the end of a few moments of sustained and progressive effort a loud cracking sound, perceptible to all the assistants, was heard ; it was the patella, which had just become replaced in the femoral trochlea. The hard cord above mentioned, formed by the superficial fascia, had disappeared ; the member had regained its power to support weight, had recovered its freedom of movement, and the patient was enabled to use the limb, which had previously been impossible. Meanwhile, there was a great limping ; the horse nodded at intervals during progression. An active vesicant was applied to the entire stifle, and he was returned to his work three weeks later. After three months the accident had not recurred.

This clinical observation recalls to us in two respects the true luxation of the patella mentioned by Cadiot and Almy in the dog, and what we have ourselves observed several times in the clinic of Alfort in the little black-and-tan English terriers. Whatever it is, we are largely convinced that it has nothing in common with the classic cramp or "stifle" of the colt, in which the member is carried in a forced extension to the rear. Here, on the contrary, segments of the limb were bent and support impossible. The patella had completely left its groove, and was by no means caught upon the eminence

formed by the internal condyle at the superior portion of the trochlea. It was not at all the tension of the internal tibio-patellar ligament which maintained this condition, but it is due rather to the external tibio-patellar ligament acted upon through the medium of the long vastus. As to the etiology of the accident, we cannot but suppose that the horse had slipped in the stable, in rolling or in getting up.

(*Revue Générale de Médicine Vétérinaire*, vol. ix., 1907, p. 191.)

STRICTURE OF THE ŒSOPHAGUS IN THE HORSE.

BY C. LESBRE.

THE animal had a hot, painful swelling, probably from a kick on the neck, over the lower part of the left jugular furrow, but he was able to feed and drink. A soft swelling remained, badly delineated, but movable under the skin. A blister was applied, and it gradually disappeared. About a month after the horse began to discharge a large quantity of saliva, mixed with food, from the mouth and nostrils. The œsophagus was engorged, and projected about 10 centimeters, and the patient refused all food. If he took a few mouthfuls he rejected them with a quantity of saliva, and any attempt to swallow brought on a violent fit of coughing. The symptoms suddenly disappeared, and the animal swallowed freely. Several recurrences took place, the last of which lasted for four days, after which the patient was cured, the constriction, which was due to the injury, having been mechanically dilated by the accumulated food.

(*Bulletin de la Société des Sciences Vétérinaires de Lyon.*)

COPPER POISONING IN THE HORSE.

BY REIMERS.

FOUR foals got loose in the night, and ate a quantity of wheat that had been cured with sulphate of copper; the estimated amount was about 600 grammes.

The foals seemed healthy next morning, and were turned out to grass as usual. About noon two appeared to be dull, and one had diarrhœa. After about twenty-four hours all were very ill, one was dead, and the author was called in.

CASE 1.—A foal, aged 5 months, stretched out on the bedding, the body covered with perspiration, and suffering from severe muscular spasms. There was difficulty in standing, and when he moved the hind quarters were unsteady. There was a vacant look about the face, the pulse at the jaw could not be felt, but the heart-beats were 105 per minute. The temperature was 41·2° C.; the conjunctiva a dark red. Refused all food, but had a great thirst. There was great straining, but the pellets of fæces were badly formed, of a greenish-yellow colour, and very fœtid. There were no signs of colic or acute pain. A Priessnitz compress was applied to the chest and abdomen,

and the body warmly clothed. The foal gradually recovered, and was cured in a few days.

CASE 2.—A foal, aged 6 months. The symptoms were the same. Temperature 40·3° C.; pulse 70; no signs of colic. The same treatment was adopted, and the patient rapidly recovered.

CASE 3.—Foal, aged 6 months. Temperature 39·3° C.; pulse 64. This case was not a severe one, and recovered in forty-eight hours.

CASE 4.—The foal that died was aged 6 months. The abdomen was greatly distended, and contained about a litre of reddish-yellow serum. The stomach was full of food, and the mucous membrane inflamed, red, and thickened. The mucous membrane of the small intestine also was thickened and covered over with hæmorrhagic patches. The liver was enlarged, of a brownish-yellow colour, and easily broken down; the spleen enlarged, and the kidneys congested. The heart was of a dark red colour, studded over with small hæmorrhagic patches.

(*Berliner Tierärztliche Wochenschrift.*)

VINSOT'S OPERATING TABLE (*TRAVAIL BASCULE*).

BY ZALEWSKY.

AFTER giving a description of the apparatus, which is well known to all French veterinary surgeons, the author enters into details as to its use, and the class of operation in which it can be employed.

He has had the apparatus in use since 1893, and speaks highly of it, having performed 215 major and 283 minor operations with it. He has also used it on 160 occasions to shoe refractory animals. In 109 cases chloroform was given, but he has never had an accident. He recommends it on account of its simplicity, the security afforded to both patient and operator, and the ease with which it can be repaired. The price he considers moderate.

(*Monatshefte für praktische Thierheilkunde.*)

Books and Periodicals, &c., Received.

Tropical Agriculturist (Ceylon); Bureau of Animal Industry; Transvaal Agricultural Journal; London University Gazette; Department of Agriculture and Technical Instruction for Ireland; Board of Agriculture.

Letters and Communications, &c.

Captain Dougall; H. Gray; L. M. Douglas.

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